# VALUE CHAIN ANALYSIS AND IDENTIFICATION OF UPGRADING OPTIONS FOR *EUCALYPTUS* POLES AND FUELWOOD IN SIDAMA. THE CASE OF HAWASSA ZURIA DISTRICT, SOUTHERN ETHIOPIA

In the fulfillment of the requirements for the academic degree of

Master of Science (MSc.)

In Tropical Forestry and Management


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# ACKNOWLEDGMENT

First of all, I would like to thank the Almighty God and Saint Marry, for giving me the aptitude, endurance, determination, and guidance throughout the ups and downs of my life.

My profound sense of gratitude goes to my supervisor Dr. rer. nat. Eckhard Auch, TU Dresden for his continuous support, encouragement and patient instructions which have always boosted my confidence. I humbly thank for his illuminating guidance, perceptual interest, valuable suggestions and ever helping mind at every step throughout my study. I am also much indebted to my co-advisors Prof. Dr. Tsegaye Bekele, Hawassa University Wondo Genet College of Forestry and Natural Resource for his constructive comments throughout the study period and proper guidance and practical suggestions during field research at Chefasine kebele, Sidama zone that enabled me to collect relevant data for my thesis. Similarly, I would like to thank Dr. Jude N. Kimengsi (Postdoc student - TU Dresden), Mr. Christopher Chesire and Mr. Hingi Ombeni, Tropical Forestry master students, for their genuine suggestions and critical comments.

I extend my sincerest thanks to Deutsche Akademische Austauschdienst e.V (DAAD) for providing an opportunity to study Tropical Forestry and for their both financial and logistic support. It is my great pleasure to thank the WoodCluster project and all staffs of the project (Prof. Dr. rer. nat. Jürgen Pretzsch, Dr. Maxi Domke and others) from TU Dresden for the coordination and follow-up. I am grateful to all the professors, lecturers, and Tropical Forestry coordinators for their invaluable support throughout my study period here in Germany.

My thank also goes to Chefasine kebele administrators, development agents and expertise, Tulla and Hawassa traders, tree growers, constructors, carpenters, Hawassa Environment, Forest and Climate change ministry and Hawassa Revenue and Customs Authority officials for their willingness and support during my filed stay. Special thank goes to Mr. Taffesse and Mr. Belayneh for their assistance and guidance during my data collection. Without their help and cooperation, the thesis would not be finalized. I also take this opportunity to extend my sincerest thanks to all of my friends who showed collaboration when I was collecting data and writing up the thesis.

Last but not least, I wish to express my highest gratitude to my families for their love, support, and encouragement throughout my life. Special thanks go to my uncle Mr. Tadesse Belay and his wife Mrs. Bayushe for their great advice and encouragement for my success.

# LIST OF ACRONYMS

| | |
|---|---|
| CBA | Commercial Bank of Ethiopia |
| Cm | Centimeter |
| CSA | Central Statistical Agency of Ethiopia |
| DA's | Developmental Agents |
| DAAD | Deutsche Akademische Austauschdienst e.V |
| DBH | Diameter at Brest Height |
| ETB | Ethiopian Birr |
| FAO | Food and Agriculture Organization |
| ha | Hectare |
| HAF's | Homestead Agroforestry systems |
| HCRCA | Hawassa City Revenue and Custom Authority |
| HEFRC | Hawassa Environment and Forest Research Center |
| HMEFCC | Hawassa Ministry of Environment, Forest and Climate Change |
| ILO | International Labour Organisation |
| m | Meter |
| NGO's | Non-Governmental Organizations |
| OECD | Organization for Economic Co-operation and Development |
| PIP | Participatory Innovative Platform |
| SIDA | Swedish International Development Cooperation Agency |
| SNNP | South Nation Nationalities and peoples of Ethiopia |
| SPSS | Statistical Package for Social Sciences |
| TGA's | Tree grower associations |
| UNSO | United Nations Statistical Office |
| TUD | Technische Universität Dresden |
| US $ | United States of America currency |
| VA | Value Added |
| VCA | Value Chain Analysis |
| WFP | World Food Program |

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***Title:*** **Value Chain and Identification of Upgrading Options for *Eucalyptus* Poles and Fuelwood in Sidama Zone, Hawassa Zuria District, Southern Ethiopia.**

Asabeneh Alemayehu[1], Eckhard Auch[1], Tsegaye Bekele[2]

## ABSTRACT

*The increasing gap between the demand and supply of wood products is linked to large-scale forest conversions to agricultural land and high population growth. Fast growing tree species like Eucalyptus have been popularised and planted by many farmers in different parts of Ethiopia to reduce the enormous supply gap. The objective of the study was to examine the value chain and identification of upgrading options for Eucalyptus poles and fuelwood in Sidama zone, Hawassa Zuria District, southern Ethiopia. The study applied value chain analysis, the theory of access, value chain governance and upgrading as well as gross margin to explores explicitly Eucalyptus products and their lines, chain actors, their function and interaction, estimate cost and value-added distribution, identify the role of Eucalyptus pole and fuelwood for actor's livelihood strategy, mechanisms and structure of access to benefit and governance type, explore supporting and enabling environments along the value chain and finally to identify options for upgrading the value chain. For the collection of primary data key informant interviews, in-depth interviews, focus group discussions, market assessment and direct observations were used and complemented by secondary data. A total of 49 actors along the chains including tree growers, middlemen, transporters, wholesalers and retailers of pole and fuelwood, workers, brokers, as well as the customers for instance constructors and carpenters, were interviewed. SPSS and excel solver was used to analyse the data and presented in graphs, tables, and descriptive texts. The results of the study revealed that tree growers, workers, middlemen, transporters, Tulla and Hawassa wholesalers and retailers of the pole, large fuelwood wholesalers and retailers, small fuelwood retailers and consumers are direct actors. Government, brokers and service providers were considered to be indirect actors in the value chain of Eucalyptus poles and fuelwood from Chefasine kebele. Among the different products produced in the kebele, Eucalyptus poles were the most traded (85%) products at Tulla and Hawassa towns followed by fuelwood (5%) traded mostly at Tulla town along the chain. The chain has two major lines for pole (line one: Chefasine to Tulla and Line two: Chefasine to Hawassa) and one major line for fuelwood. Very limited processing takes place at the tree growers' level for both pole and fuelwood and the major proportion of value addition occurs at the middlemen level for line two of pole and fuelwood, and at Tulla pole wholesalers and retailers' level for line one of Eucalyptus poles. Production, processing, marketing and consumption were the four main functional activities along the chain. The trade of Eucalyptus products was financially profitable for all actors in the chain. However, the benefit distribution was unequal and commercialization margin was increasingly distributed towards the downstream actors for poles while for fuelwood, middlemen grasped the higher benefit and commercialization margin. Eucalyptus was the second profitable livelihood option next to homestead agroforestry but was the first profitable as compared individually with khat, coffee, enset and other activities. Apart from income provision, Eucalyptus was used for conservation of degraded land, construction, firewood, shading, and a form of saving among other uses in the study area. The income from Eucalyptus was also among others used for education fees, house renting and purchase household consumption goods (food, cloth, equipment) and others. Supporting services were almost non-existent for Eucalyptus production and marketing. Access to finance, market information, relationships building, capital, labour opportunity, license and Eucalyptus products were the means of controlling and maintaining market dynamics. Market types of value chain governance with a low level of horizontal and vertical coordination as well as low level of explicit coordination was observed for the value chain of Eucalyptus poles and fuelwood. Disease, lack of market information, lack of support, lack of road access, lack of storage space and limited technologies as well as inadequate land were the major constraints identified from the focus group discussion and Participatory Innovative Platform (PIP). Organising tree growers for marketing and information sharing, organising traders for storage, provision of market infrastructures, easing credit access, training on silvicultural management, technologies adoption, implementing the existing policies and enforcing rules and regulations were some of the options identified for the upgrading of the product's chain.*

***Keywords: value chain; smallholder; Eucalyptus; actor; benefit distribution; value added; commercialization margin; access mechanisms; governances; upgrading***.

# CHAPTER ONE

# 1 INTRODUCTION

## 1.1 Background of the study

Value chain is a concept and a framework for organizing and analyzing information on how inputs and services are brought together and then used to grow, transform, or manufacture a product and then how the product moves from the producer to the consumer as well as how value is increased along the way. It is defined by Trienekens (2011: p:59) as "a network of horizontally and vertically related companies that jointly aim at/work towards providing products or services to a market". Similarly, according to Kaplinsky and Morris (2001), value chain is all functional activities and firms involved in producing and distributing a product or service, from input supply and product design through to its final disposal by the consumer. The value chain approach is used to capture the interactions of increasingly dynamic and complex markets in developing countries and to examine the inter-relationships between diverse actors involved in all stages of the marketing channel (Kaplinsky and Morris 2001; Trienekens 2011). It provides the basic understanding needed for designing and implementing appropriate development programs and policies and helps to improve the livelihood of the poor by providing the market channel, market information and identifying marketing problems which are important to reduce transaction costs and to ensure proper benefits shares that are rarely seen in most of the developing countries (Earthscan 2011; Aoudji et al. 2012) for most of the agricultural and forest products.

Nowadays, in developing countries, smallholder forestry; the management of woodlots by smallholder farmers, has been gaining more and more importance (Harrison et al. 2002) due to the high and increasing demands for wood for both constructions as well as fuelwood needs. The smallholder farmers are often opting to plant fast growing, highly utilizable, and exotic tree species. This is proved by many countries that have shown interest in *Eucalyptus* and have planted from 0.7 million ha in 1955 to more than 20 million ha in 2009 worldwide outside its natural range, Australia (Shi et al. 2012).

*Eucalyptus*, a fast-growing tree, is found in tropical and sub-tropical climates. It is a native tree in Australia and is one of the most planted genera of trees in the tropics (Teketay 2000; Gil et al. 2010). There are about 800 species of *Eucalyptus* in the world. In Africa, about 100 *Eucalyptus* species are grown as exotic species (Dessie and Erkossa 2011). The East African countries like Ethiopia, Rwanda, Kenya, Sudan and Somalia have started to introduce the species during the second half of the 19$^{th}$ century and the beginning of the 20$^{th}$ century. In Ethiopia, *Eucalyptus* was first introduced in 1895 with the objectives of meeting the steadily increasing demand for construction poles and fuelwood in Addis Ababa (Gil et al.

2010). During that time, Emperor Menelik II was advised/supported by the French railway engineer and philologist Mondon-Vidaille (Breitenbach 1961).

*Eucalyptus* plantations have expanded greatly throughout Africa and particularly in Ethiopia, because of its both very high yield and its ability to adapt to a long range of environmental conditions. This rapid growth and adaptability to a range of conditions have made it more preferable than any other exotic species grown in the country (Bekele 2015). It grows well in various ecological zones, especially, on the dryer and degraded lands, poor soils, farmland boundaries, around homesteads, on roadsides, and along borders and riverbanks (Mekonnen et al. 2007; Mengist 2011; Bekele 2015). The physiological characteristics of the species including the leaves and shoots being not easily palatable to animals, it's high resistance to stress with less risk of pest attack and damage made it spread and success various environmental conditions. High coppicing potential and fewer management needs have also contributed a lot to the spread and success of the species (Teketay 2000; Jagger and Pender 2003; Mengist 2011). In addition, the growing demand for construction material and fuelwood, caused by the growing population, has led to the increased plantation of *Eucalyptus* by smallholder farmers.

Currently, *Eucalyptus* is the most utilized tree species in Ethiopia. It is one of the most commonly planted tree species for construction and Wood fuel (fuelwood and charcoal purposes) (Bekele et al. 2013). In the past, the utilization of *Eucalyptus* was restricted to farmers domestic demands such as fuelwood, house construction, crafting farm implements, fencing, heating and other related activities (Selamyihun 2004; Selamyihun et al. 2005; Gil et al. 2010; Zerihun 2010; Dessie and Erkossa 2011). Nowadays farmers grow *Eucalyptus* as a cash crop and it constitutes an important element in their livelihood strategy. Moreover, *Eucalyptus* has the potential to substitute endogenous tree species and supply the wood product demand in Ethiopia, particularly the industrial demand for the wood product such as lumber, plywood veneer, poles and pulp (Abebe and Tadesse 2010; Bekele 2011). According to Bekele (2015), the major wood factories in Ethiopia are using *Eucalyptus* mostly, *E. globulus* as raw materials to produce sawn timber. The total consumption of the wood products is growing as the population is growing. With the increasing population growth in Ethiopia, the demand for fuelwood and construction material at the household level cannot anymore be supplied by natural forest and by state-owned plantations. Ethiopia must access new sources of wood supply like from private and smallholder forest plantations. Since *Eucalyptus* has become a commodity with high demand and market, some farmers started to convert parts of their cropland into *Eucalyptus* woodlots, especially on the Ethiopian highlands (Zerihun 2010; Kebebew and Ayele 2010; Bekele 2015). It is also believed that because of nutrient mining agriculture, land degradation and erosion the income from agricultural products has become reduced and this leads the farmers to convert their land into plantation forest. According to Jenbere et al. (2012), in Arsi zone, Oromia region, about 90% of the respondents planted *Eucalyptus*, and 52% of them were engaged in planting since the late 1990s. About 11% of the cropland was cultivated with *Eucalyptus*. This implies that Ethiopia needs

not only crop but also wood for survival. Thus, improving the production of *Eucalyptus* plantation and the value of its products such as pole and fuelwood helps to sustain the rural households with food security, reduces poverty and adapt the changing climate. To achieve this, there is a need to identify different upgrading options. According to Gereffi (1999), upgrading is particularly seen as an opportunity for actors in the developing countries to improve capabilities such as, innovations and market access and receive more power through the flow of knowledge from buyers to producers in the upstream.

## 1.2 Problem of the statement

In Ethiopia, there is a huge gap between the supply and demand for wood products, which results from large-scale forest conversion and degradation as well as from population increment. In 2013, the wood supply gap in Ethiopia was on a level of 38.8 million $m^3$ per year, with an increasing trend (Bekele 2011). Besides, a recent report by the World Bank (2017) showed that Ethiopia's total wood demand will increase from 4.1 million $m^3$ in 2013 to 16.7 million $m^3$ in 2040, with a supply gap of 13.3 million $m^3$. In addition, the increasing supply gap is currently filled by the destructive utilization of natural forests and partly covered by timber and wood products imports. To minimize the gap and supply the growing wood product demand with sustainable domestic production, significant investments in plantations and improved wood-processing technologies are required.

In Ethiopia wood, charcoal, agricultural residues and animal dung are the most common cooking fuel types. The traditional biomass from wood, charcoal and dung in households account for 90% of the total energy consumption (Azemeraw et al. 2013). The contribution of wood for cooking covers the higher percentage (63% for urban and 91 % for rural households). The contribution of *Eucalyptus* for this biomass production is higher as many reports showed. For example, Mekonnen et al. (2007) showed that 78% of the fuelwood and 20% charcoal are from *Eucalyptus* in Ethiopia. Bewket (2005) found that 75% of the fuelwood demand is covered by *Eucalyptus* in Chemoga watershed. In addition, according to Kelemu and Tadesse (2010), more than 90% of the population's energy supply comes from *Eucalyptus* biomass in Ethiopia. In the study area, Chefasine kebele, *Eucalyptus* woodlot has been practiced since a long time for the purpose of fuelwood and construction and the majority of the household meet their wood demand from the *Eucalyptus* woodlots (Shibrie 2017). Which means, it has a crucial role in the supply of the much-needed energy in the country as well in the study area.

However, several scientists and communities undermined the potential of the species instead of enhancing and upscaling its production. They argue that it has negative environmental externalities which are associated with its effects in terms of depletion of nutrients, acidification, allelopathic effects caused by litter which suppress other vegetations and excessive water utilization, cause of erosion and other adverse

effects on nutrient cycling (Zhang and Fu 2009; Rassaeifar et al. 2013; Bekele 2015). However, it is fact that other drivers like large-scale forest conversion, nutrient mining agriculture, overgrazing etc. have led to the problems, and *Eucalyptus* plantation is now rather the consequence as the cause of run-down land and water resources. *Eucalyptus* grows rapidly, and as a result, it prevents deforestation and serves as a saviour of natural forest resources. In the face of growing economy, population, and increased demand for wood products, *Eucalyptus* remains to be the desired species that grow fast and produce wood to meet the current demand for construction, fuel and furniture materials (Zerfu 2002; Mekonnen et al. 2007; Bekele 2015). Besides the opportunities for processing and adding value, *Eucalyptus* needs to be investigated so that its contribution to poverty alleviation can be enhanced and negative ecological impacts can be minimized.

Thus, attention to adding value to the *Eucalyptus* products should have a great role to enhance the value of *Eucalyptus* and improve the livelihood of the communities. In the study kebele, Chefasine, studies on *Eucalyptus* woodlot profitability and woodlot performance were conducted (Shibire 2017; Thiem 2018). However, research on value chain analysis of *Eucalyptus* products and upgrading options has received little attention. Information on how to improve and sustain the production and marketing system of *Eucalyptus* pole and fuelwood is lacking in the current literature. In this regard, the value chain of *Eucalyptus* pole and fuelwood can be an important input for policies, decision-makers, farmers and practitioners. Therefore, this study examined the value chain of *Eucalyptus* products (pole and fuelwood) in Chefasine kebele, Hawassa Zuria District, Sidama zone. The study maps the *Eucalyptus* product value chains, identified actors involved in the chain, the benefit shared and destinations of the *Eucalyptus* products, the role of *Eucalyptus* pole and fuelwood for actor's livelihood strategies, supporting and enabling environments as well institutional access and governance.

## 1.3 Research objective and questions of the study

In Ethiopia, where forest resources are highly fragmented and continuously converted, securing the benefits of forestry through value chain upgrading for the local people's livelihood is an important concept. It helps them to engage in the sustainable management and conservation of the resources. The main objective of the study was to analyse the value chain of *Eucalyptus* products (pole and fuelwood) and identify upgrading options from the producer to the end users in Sidama zone, Hawassa Zuria District of Southern Ethiopia.

Specific objectives and related research questions are:

1. To map the product flow of *Eucalyptus* from production to end user based on smallholder *Eucalyptus* plantations in Chefasine Kebele, Sidama zone, Southern Ethiopia.
    1. What are the products of *Eucalyptus* and how is the product line from producer to consumer?

2. What are the main activities carried out in the value chain of *Eucalyptus* products?
3. Who are the main actors in the *Eucalyptus* pole and fuelwood value chain?

2. To characterize *Eucalyptus* pole and fuelwood actor's interactions, functions and linkages in the value chains
    1. How do value chain actors interact and what are their functions in the chain?
3. To identify the value added and its distribution along the chain and determine the role of *Eucalyptus* pole and fuelwood business to actor's livelihood strategies and contribution to actor's incomes.
    1. How much is the added value in each node?
    2. How is the added value distributed along the chain?
    3. What are the roles of *Eucalyptus* pole and fuelwood business to actor's livelihood strategies and its contribution to actor's income?
4. To examine the regulating and supporting environment of *Eucalyptus* pole and fuelwood value chain and describe how actor groups are affected.
    1. What are the factors that affect the value chain of *Eucalyptus* pole and fuelwood?
    2. How are the actor groups affected?
5. To assess coordination, power distribution and governance of the value chains.
    1. Who determines the prices, how negotiation and exchange take place, what and who controls the power, where is power concentrated and how access to *Eucalyptus* product is maintained and controlled?
    2. What type of governance exists in the value chain?
6. To identify options for upgrading and improving the value chain focusing on cooperation amongst producer.
    1. What gaps and weaknesses, constraints and problems exist for the value chain?
    2. What are the options for upgrading and improving the value chain?
    3. What are the opportunities for future cooperation among producer farmers?

## 1.4 Limitation of the study

The study overviews the value chain and upgrading options of *Eucalyptus* poles and fuelwood originating from Chefasine kebele, Hawassa Zuria District, Sidama zone, and traded at Tulla and Hawassa towns. The study was confined in only Chefasine kebele and covers Tulla and Hawassa town wholesalers and retailers. Due to the limited time in data collection, this study considered cost and margin as financial analysis, governance and linkage, the enabling and supportive environment as the structural element but does not embrace the developmental and environmental aspects for the whole value chain.

During data collection, some of the principal actors including transporters, middlemen, wholesalers and retailers were unwilling to answer some of the questions in the questionnaire due to their worry of the government to come and allocate tax on their products and replace their vending /marketing area into other areas. Answers were given depending on their memory recall especially for farmers, customers and traders, because most of them did not keep records. Thus, the researcher had to probe the respondent and used different means of triangulation methods through, for example, data from governmental official and market observation. Moreover, estimations of average annual crop yield and income were based on what interviewed tree growers could recall on the study year, which may not be representative years. Despite the above limitations, the data collected was reliable and adequate to address the objectives set in the study.

## 1.5 Organization of the thesis

The thesis consists of six different chapters. Chapter one was about the introductory chapter and provides general information about the study followed by problems, justification, objectives and questions of the study. It also covers the limitation of the study. Chapter two reviews the history, importance and products of *Eucalyptus* in Ethiopia. It was followed by an extensive review of value chain analysis (VCA) and then a conceptual framework for the study was outlined. In chapter three, descriptions of the study area, the design of the research and detailed methodological procedures on how the study was carried out were described and given. Moreover, it provided detailed information on how data was analyzed and presented. The results and their presentations were given in chapter four. This chapter begins with the overview of the characteristics of respondents and status of *Eucalyptus* plantation in Chefasine. In this chapter, the products and their flow, functional activities, detailed value chain maps, functions and interactions of actor's groups were briefly described. Then the cost, margin and value added of actors were presented. Also, the enabling and supporting environment, the role of *Eucalyptus* on the livelihood strategy of actors and its income contribution, access mechanisms of *Eucalyptus* products and governance types of the chain were given in detail. At last, the information on challenges, problems and constraints and options to upgrade the chain were provided from both the survey and Participatory Innovative Platform (PIP) workshop. Chapter five provided the discussion of the methodology and the results. Conclusions and recommendations were described and forwarded under chapter six. Finally, bibliographies, questionnaires for the interview and the detail on the calculation of the revenue, cost, margin and profit margin of *Eucalyptus* pole and fuelwood, as well as gross margin of selected crops were given. In the end, pictures from the field were provided.

# CHAPTER TWO

# 2 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This part is intended to critically review the literature of the past research work of relevance to the present study objective so that theoretical views and empirical evidence of the reviews enables a better understanding of the subject. It includes summaries on the certain concepts used in this study.

## 2.1 Historical development and current status of *Eucalyptus* plantation in Ethiopia

Tree planting activities in Ethiopia has a long history. According to historical records, afforestation started in the early 1400s by the order of King Zera-Yakob (1434-1468) but modern tree planting using introduced tree species (Australian *Eucalyptus*) was started when Emperor Menellik II (1889-1913) investigated solutions for alleviating shortage of firewood and construction wood in the capital, Addis Ababa (Melaku 1992; Gil et al. 2010). In addition to the shortage of firewood and construction, the loss of agricultural productivity resulted from overutilization of the forest without proper management was another challenge for the government of Ethiopia. Ethiopia lost most of its forest resources especially during the 20$^{th}$ century (Melaku 1992).

Thus, introducing and planting of fast-growing species like *Eucalyptus* were among the options for the government of Ethiopia to overcome the problems of land degradation and a shortage of fuel and construction wood. *Eucalyptus* is one of the most planted woody species in the world next to *Pinus and Cunninghamia,* (Oballa et al. 2010). It belongs to the family *Myrtaceae*, subfamily *Myrotideae*. It is one of the diverse genus of flowering plants in the world and comprises eight hundred species (Mengist 2011). It is native to Australia and Tasmania with a small number of species also found in New Guinea, the Philippines and Indonesia (Gil et al. 2010). *Eucalyptus* planting has a long history in Ethiopia, dating back to the late 1800s, intensive plantations surrounding Addis Ababa (Jagger and Pender 2000). Some years after the introduction, farmers showed great interest to plant the species as woodlots, home gardens, boundary demarcations and as roadside plants in the country. Beside this, missionaries planted *Eucalyptus* in a different area of the country namely, Ghimbi, Debre Tabor and Harar areas (Birru et al. 2013). In the beginning of the 20$^{th}$ century, farmers in and around Addis Ababa received incentives such as tax-free land, seedlings and seeds from the government as an encouragement to plant the species.

The first *Eucalyptus* plantation survey was conducted from 1935 to 1940 by Italians and 4,500 to 5,000 ha of *Eucalyptus* were found (Pohjonen and Pukkala 1990). Then in between 1975 and 1994, additional new plantations were planted mainly in peri-urban areas with support from international donors such as UNSO, SIDA, and WFP (FAO 2006). *Eucalyptus* plantation covered 477,000 ha (Amare 2000) in the 2002

and currently, over 500,000 ha of the land is covered by *Eucalyptus* plantations (Abebe and Tadesse 2014) (fig. 1). Nowadays, *Eucalyptus* is the most planted tree species in the country and made Ethiopia among the ten major *Eucalyptus* growing countries in the world. *Eucalyptus* plantation spreads widely through small holder's woodlot plantations (Jaleta et al. 2016).

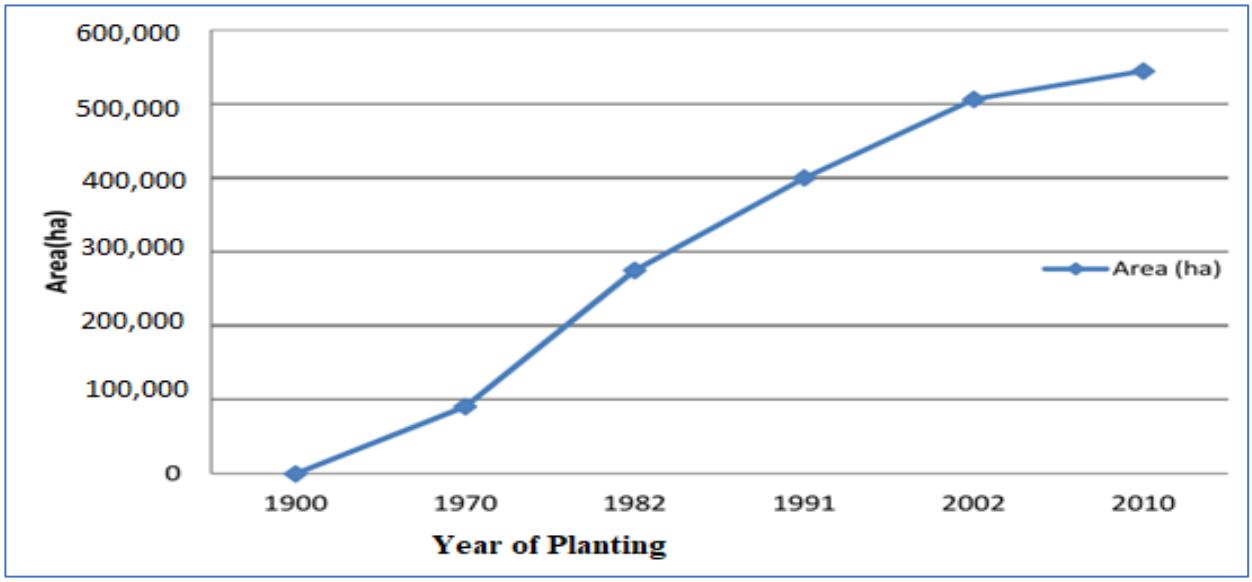


FIGURE 1. HISTORICAL DISTRIBUTION OF *EUCALYPTUS* IN ETHIOPIA, BASED ON DATA FROM POHJONEN AND PUKKALA (1990), AMARE (2002); GESSESSE AND TEKELU (2011) AND ABEBE AND TADESSE (2014).

Moreover, farmers are converting parts of their agricultural lands into *Eucalyptus* woodlots (fig. 2) to meet the increased demand for wood and wood products. The change of crops is triggered by the reduced agricultural crop yields, unaffordability of fertilizer and the failure of annual and perennial crops like coffee and potato due to diseases and pests. Also the need for high management inputs, low price of agricultural crops and livestock, and high market demand with a lower production cost of *Eucalyptus* woodlot has encouraged households to convert their crop and grazing lands to *Eucalyptus* woodlots (Gil et al. 2010; Gizachew 2017). Besides, studies from the different parties of the country such as Tigray, Gondar, Wollo, Wolayita, South and Central Ethiopia confirms the increasing trend of *Eucalyptus* plantations (Mekonnen et al. 2007, Dereje 2009; Jaleta et al. 2016 and Gizachew 2017). However, despite this increasing trend, some scientists and community leaders undermined the potential of the species instead of enhancing and upscaling its production and marketing (Zhang and Fu 2009; Rassaeifar et al. 2013). But there is a need to develop an appropriate management system, minimize its negative effects and enhance the value of *Eucalyptus* and improve the livelihood of the communities.

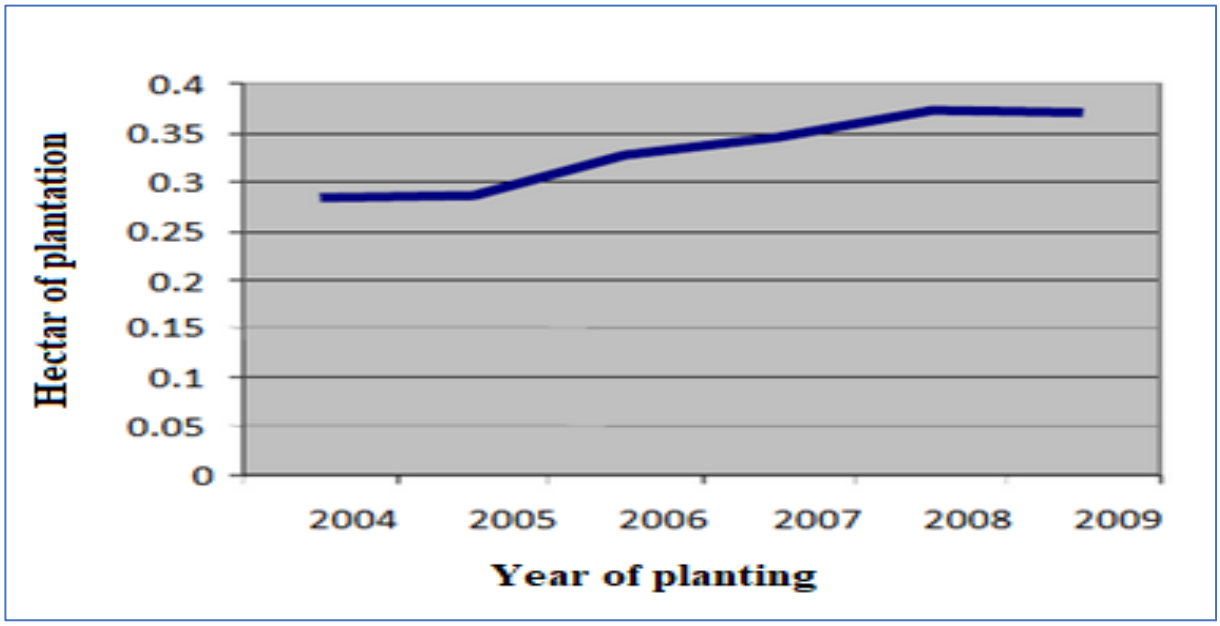


FIGURE 2. LAND ALLOCATION TREND FOR *EUCALYPTUS* PRODUCTION PER HECTARE PER HECTARE PER YEAR (SOURCES: GIL ET AL. (2010)).

### 2.2 Products and services from *Eucalyptus* woodlot

Currently, Ethiopia holds the largest portions of *Eucalyptus* plantation in East Africa. Smallholder farmers in Ethiopia grow *Eucalyptus* mainly for fuelwood, charcoal, construction wood, poles and furniture making. According to Amare (2002), *Eucalyptus* trees are suitable for the two key functions, namely for the household fuelwood needs of both urban and rural households and pole (for construction and fencing). Some of the many products and services of *Eucalyptus* in Ethiopia are shown below in Table 1. It can be used for fuelwood, building and fencing, plywood, telephone transmission poles, pulp, medicine, perfumery, environmental conservation and honey production (Davidson 1989; Pohjonen and Pukkala 1990; Jagger and Pender 2000; Teketay 2000; Amare 2002; Zerfu 2002; Hailu et al. 2003; Mekonnen et al. 2007; FAO 2009; Gessesse and Erkossa 2011; Gebrekidan et al. 2012; Jaleta et al. 2016; Daba 2016).

Table 1: *Eucalyptus* products and services in Ethiopia.

| ***Eucalyptus* product and services** | **Description** |
|---|---|
| Fuelwood and charcoal | The most important benefit of *Eucalyptus* in Ethiopia is for fuelwood, as household energy. Also, charcoal is produced from *Eucalyptus*. |
| Transmission Poles | Almost all power and telephone line use *Eucalyptus* transmission poles |
| Pole (Building, fencing) | Almost all wooden houses and wooden fences are built from *Eucalyptus*. |
| Scaffolding | The construction boom in the country including skyscrapers, bridges, dams and roads use *Eucalyptus* scaffolding |
| Pulp and Paper | Important sources of raw material for pulp and paper. |
| Lumber | Not produced commercially, but at the household level, done by pitsaw. |
| Perfume | The essential oil is produced from leaves of *E. globulus* and *E. citriodora* |
| Plywood | There are few plywood plants using *Eucalyptus* in the country. |
| Medicine | *Eucalyptus* is used as a medicine at household and community e.g. *E. globulus* leaves are used to treat common cold and flus. |
| Honey production | *Eucalyptus* flowers pollen are important for bee forage. |
| **Environmental services** | |
| Environmental conservation | *Eucalyptus* trees are planted for gully stabilizations, soil conservation and road embankments strengthening. |
| Nurse tree | Experiences showed that some indigenous trees such as *Juniperus procera, Podocarpus falcatus* can regenerate well under *Eucalyptus* stands. |
| **Socioeconomic services** | |
| Livelihood | Contribute positively to income/food security. Growing of *Eucalyptus* is considered a grower's green bank account. |
| Economic | *Eucalyptus* is a high-value cash crop. In Ethiopia, about 25% of a farmer's income is from Eucalyptus. |
| Social significance | Owning *Eucalyptus* stand is considered a sign of affluence/wealth. |
| Land tenure | Farmer's plant *Eucalyptus* to ensure land tenure security in case of dispute or if the landowner cannot cultivate the land for some reason. |

**Sources:** Davidson (1989); Pohjonen and Pukkala (1990); Jagger and Pender (2000); Teketay (2000); Amare (2002); Zerfu (2002); Hailu et al. (2003); Mekonnen et al. (2007); FAO (2009); Gessesse and Erkossa (2011); Gebrekidan et al. (2012); Abebe and Tadesse (2014); Bekele (2015); Jaleta et al. (2016) and Daba (2016).

## 2.3 Socio economic benefits of *Eucalyptus* species in Ethiopia

*Eucalyptus* has various socio-economic uses such as employment, security and financial benefit, not only in the rural production systems but also for the urban energy (charcoal) and construction (scaffolding) sector. It also played a significant role in improving the livelihoods of rural communities, poverty reduction and reducing the pressure from remnant native forests especially in the highlands of the country (Tadele et al. 2014; Daba 2016). *Eucalyptus* plantation has significantly contributed to the household income improvement that leads to poverty reduction (Mekonnen et al. 2007; Kelemu and Tadesse 2010). It is the largest non-agricultural source of household income in many areas of Ethiopia (Jagger and Pender 2000; Kelemu and Tadesse 2010). According to Mekonnen et al. (2007), the income from *Eucalyptus* contributes up to 72% of total household annual cash income for farm household in the central highlands of Ethiopia. Correspondingly, Kebebew and Ayele (2010) revealed that *Eucalyptus* can increase the income from cultivating land up to 90% and reversely substituting the *Eucalyptus* covered land by important crops such as teff and barley may reduce the income from this land by 125%.

*Eucalyptus* plantations are highly preferred and appreciated by the local people than other indigenous or exotic tree species, because of its high biomass production and rapid growth rate. They produce valuable construction poles and fuelwood in a reasonably short period of time for the local market, thus providing cash income for local village communities (Hailu et al. 2003). Leaves, twigs and barks of *Eucalyptus* are ranked by women and children in many regions of the country for fuelwood. Apart from its financial and economic gains some farmers also give emphasis to other values of *Eucalyptus* woodlot management (Gil et al. 2010). Having *Eucalyptus* woodlot increased the confidences of cultivators on their livelihood cash income. Some of the farmers consider their *Eucalyptus* plantation as a green bank account. Besides, the species has got a special value from the cultural viewpoint of society. In some societies, it has great prestige value.

## 2.4 *Eucalyptus* and government in Ethiopia

*Eucalyptus* is one of the most successful exotic species in Ethiopia, however, it has been criticized by different professionals, interest groups and government policymakers. According to (Selamyihun et al. 2005; Gil et al. 2010; Bekele 2015; Daba 2016), the species provides a range of benefits particularly for the rural peoples and generally for the countries wood demand. However, most of the criticisms are out of the impact of the environment. For example, a study by Selamyihun et al. (2005) revealed a reduction of crop yield on areas that *Eucalyptus* trees were planted, while the good financial benefit of the species could be taken as a good compensation. Also, the availability of wood biomass from *Eucalyptus* will reduce the demand for dung and crop residues for fuel, which on the other way used to improve the soil fertility and

crop production. Dessie and Erkossa (2011) also proves some of the criticisms of the *Eucalyptus* but argue that only some species, mainly the deep-rooted types, drain water resources, and that poor forestry practices, like high planting densities and short crop rotations, are primarily responsible for depletion of the soil's nutrients, increased soil erosion, and suppression of the undergrowth.

However, some of the criticisms are not rational (Davidson 1989). According to Davidson, *Eucalyptus* is not an exceptional exotic tree species that have all the impacts and argued that other species have similar effects. Until now arguments are continued among experts and professionals, while farmers are converting their cropland into *Eucalyptus* woodlots (Gil et al. 2010; Zerihun 2010; Gizachew 2017). The reason for the farmers are different, some are impressed by the current market price, some need it to fill the gap for their shortage of fuel and construction wood demand, and other planted it because of their low land productivity and to secure their tenure right (Gil et al. 210; Zerihun 2010; Daba 2016). Some authors (Mekonnen et al. 2007; Bekele 2015) argue that planting of *Eucalyptus* could be the best option to minimize the current wood demand of the country, with a special focus on species selection, proper matching of species to the site and proper management. A recent study also shows *Eucalyptus* spp. forests favor the selection of woody plants if it is managed well, with the appropriate species-to-site establishment (Alem and Nakhooda 2017).

## 2.5 Theoretical Framework

### 2.5.1 Understanding the concept of value chain

Value chain analysis is originated from the discussion of two distinct traditions, namely the French 'filière concept' and Wallerstein's concept of a commodity chain (Faße et al. 2009). The filière approach emerged in France in the 1960s to address industrial economic problems with the main emphasis on the economies of scale, transaction cost, and input-output relationships (Raikes et al. 2000). In the 1970s, Wallerstein (1976) developed the concept of commodity chains. Commodity chain tries to explain the dynamics of the distribution of value chain activities in a capitalist world economy (Raikes et al. 2000). From this two concepts emerged Porter's concept of the value chain, Gereffi's global commodity chain, and Humphrey's world economic triangle, whereas the last two were joined to the concept of the global value chain (Faße et al. 2009).

In the mid-1980s, Porter developed the concept of the value chain, in the context of his work on competitive advantage (Porter 1998). He developed the concept to analyse a specific activity through which companies may create value by breaking down their activities into value-added. It is a concept and a framework for organising and analysing information and defined by Kaplinsky and Morris (2001) as "full range of activities which are required to bring a product or service passing through the intermediate phases

of production (transformation and producer services inputs) to delivery to consumers and final disposal after use". It defines a set of enterprises that perform the business activities i.e. the producers, processors, traders and distributors of the product. Enterprises are linked by a series of business transactions by which the product is passed on from primary producers to consumers in end markets (Springer-Heinze 2017).

In the past decades, several extensive theories have been built in the field of value chains. These theories were reflected in many definitions and approaches; which vary mainly in their objectives, in the activity that is underlined, and in the pathway in which they have been applied (Trienekens 2011). According to Trienekens (2011), value chain analysis in developing countries are characterized by its network structure, its governance form and the way value is added. These approaches underlined value chains, as a production network, in which actors exploit competitive resources and function within an organized environment (Trienekens 2011).

The structure of the value chain network has two dimensions; the vertical and horizontal dimension. The vertical dimension of value chain refers the flow of products from the initial producer up to the last consumer, while the horizontal dimension reflects the relationship between stakeholders in the same chain link such as farmer to farmer (Kaplinsky and Morris 2001; Trienekens 2011; Islam 2014). The shape of the vertical relationship may follow many stages or may not, while horizontal relationships have various shapes between the stakeholders such as farmer cooperatives or price agreements between wholesalers. Therefore, the value chain network structure is the principle dynamics of all sectors of the economy. Value added is "the difference between the sale price of goods sold and the cost of materials and supplies used in the production" (Klemperer 1996: p.573) cited by Auch (2017) in his lecture note. It is decided by the last level of consumers' willingness to pay in the value chain (Islam 2014). The value chain governance discussed the power and bargaining power position of value chain actors, and related distribution of value added between economic actors. It also explains the policy matter and access to the market by the actors (Trienekens 2011; Hulusjö 2013; Islam 2014 ).

To address the problem of rural community information regarding on production, marketing and distribution, regulating and supporting environment, coordination, power distribution and governance of the value chains are very important. Value chain is an effective approach in tracing the product flows, showing the value-adding stages, identifying key actors in the chain and the entire power relationship and linkage between the actors, assessing market dynamics and governance issues (Kaplinsky and Morris 2001; Schure et al. 2014). A typical value chain follows the basic steps outlined in figure 3. The steps include production, processing, transport and trade, distribution and retail, and consumption.


FIGURE 3: BASIC STEPS OF A TYPICAL VALUE CHAIN (SOURCE: SCHURE ET AL. (2014: P.4)).

### 2.5.2 Theory of access

Institutions such as property rights are very important to determine the use of the resources and to influence the behaviour of the basic resource's user. Access is used frequently by property right analysts. However, Ribot (1998) and Ribot and Peluso (2003) argue that access differs from a property in multiple ways. They defined the theory of access as the "ability to benefits from things", including material objects, persons, institutions, and symbols. Access analysis helps to understand why some people (actors) or institutions benefit from resources, whether they have rights to them. This theory justifies that property is not the only means, but access is also very important to reap benefit from the resources. It shows the distribution of benefits and the mechanisms, structures, and processes that lead to the control and maintenance of access to benefit (Ribot 1998; Ribot and Peluso 2003) and it indicates that the theory of access is broader than the properties defined as 'the right to benefit from things'.

As contrasting to property as a 'bundle of rights' access is viewed as a 'bundle of power' (Ostrom and Schlager 1996). Access includes both de jure and de facto mechanisms that govern resource use whereas property rights are de jure that does not allow total benefit (Ribot 1998). Ribot and Peluso (2003) mentioned a number of factors that influence benefits from a given resource including infrastructure, access to technology, capital, markets, labour, skill and knowledge, authority, identity, and social relations. They argue that the access approach is more helpful for analysing how different actors generate benefit from the things whether or not they hold the right to them.

### 2.5.3 Value chain governance (Coordination)

Governance in a value chain refers to the structure of relationship and coordination mechanisms that exist amongst dispersed but linked production system (Velde et al. 2006). Value chain governance determines the allocation of resources and gains and their flow within the chain. It includes the institutional mechanisms set by the actors themselves in the chain and the external rules set by the government or other standard setting organizations. Very often it is understood as the power to define who and who does not participate in the chain, the setting of rules of inclusion, assisting chain participants to achieve the standards set, and monitoring their performance (Kaplinsky and Morris 2001). The main concern of value chain governance

covers how actors are organized, where power is concentrated among actors, how prices are set and how financial, material and human resources are allocated and flow within a chain.

Two different types of governance in value chain namely, 'producer-driven' and 'buyer-driven' governance were introduced initially by Gereffi (1999). In buyer-driven value chains governance, buyers undertake coordination, control negotiation and production, while in producer-driven value chains producers play a key role. Later, Gereffi et al. (2005) used three different variables to elaborate and distinguished five types of governance; namely markets, modular value chain, relational value chain, captive value chain and hierarchy (Table 2). The three variables are: complexity of information and knowledge transfer which is required to sustain a particular transaction particularly with respect to product and process specifications, codification of information and knowledge, the extent to which this information and knowledge can be codified and, therefore, transmitted efficiently and without transaction-specific investment between the parties to the transaction and capabilities of actual and potential suppliers in relation to the requirements of the transaction.

Table 2. Value chain governance types and their determinants.

| Governance type | Complexity of transaction/information | Ability to codify transaction/information | supplier's capability | Power exerted | Degree of explicit coordination and power asymmetry |
|---|---|---|---|---|---|
| Market | Low | High | High | Price | Low |
| Modular | High | High | High | Turnkey supplier | ↕ |
| Relational | High | Low | High | Relational supplier | |
| Captive | High | High | Low | lead firm | |
| Hierarchy | High | Low | Low | lead firm | High |

Sources: Gereffi et al. (2005 p:90).

In the market value chain, many suppliers and buyers are interacting, and this results in low power asymmetry between the actors involved. In this type of government, the conditions of the exchanging goods and services are negotiated daily based on the market price. Modular value chain arises when the ability to codify specifications extends to complex products. In this value chain, suppliers make products to a customer's specifications and take responsibility for competencies surrounding process technology and incur few transaction-specific investments. In relational value chains, there are complex interactions between buyer and seller and creates mutual dependence and asset specificity. The relationship is regulated by reputation, social and spatial proximity, family and ethnic ties, etc. In captive value chains, small suppliers depend on much larger buyers for their transactions and face significant switching costs. These

networks are frequently characterized by a high degree of monitoring and control by the lead firm, creating dependence on the suppliers. The last one is the hierarchy value chain governance structure. This implies vertical integration with managerial control. In captive and hierarchy value chains, power is exerted directly from the lead firm as in the case of administrative control of top management to its subordinates. Thus, the degrees of asymmetry and explicit coordination is high for captive and hierarchy governance types resulted from direct control (Gereffi et al. 2005).

### 2.5.4 Upgrading the value chain

Upgrading the value chain is "a process that enables a firm or any other actor of the chain to take more value intensive functions in the chain. Kaplinsky and Morris (2001) defined upgrading as a means that individuals, firms or even a whole country improve its original situation through "changes in the nature and mix of activities, both within each linkage in the chain and in the distribution of intra-chain activities". Upgrading the chain relates to any change, adoption and adaptation processes. This may require innovation by forest owners, researchers and institutional or policy actors (Weiss et al. 2011). Innovation system is a set-up where institutions and stakeholders, like private firms, research institutions, governmental agencies and legal regulations, provide an enabling environment and synergetic interactions towards innovations in their various forms. It encompasses product innovation (including goods and services) and process innovations (including technological and organisational innovations) (Rametsteiner et al. 2005). In addition to the four categories, which are a product, process, marketing and organization (OECD 2005), process and institutional innovations are important to provide enabling environment and change the livelihood of each actor (Weiss et al. 2011).

## 2.6 Conceptual framework

The value chain framework of Kaplinsky and Morris (2001) is the base for the conceptual framework of the present study. Marketing systems especially access plays a significant role in enhancing the production and consumption of agricultural and forestry products (Islam 2014). Value chain analysis analyses the organization and behaviour of all the actors, factors, and the relationship of commodity chains in the value chain, and also delivers the distribution of value added over various actors (Ribot 1998; Kaplinsky and Morris 2001; Ribot and Peluso 2003; Islam 2014). The method is best examined through the combination of theories of the value chain governance and access (Islam 2014).

As stated above (section 2.5.1), the value chain of developing countries is charactersied by its network structure, its governance form and the way value is added (Trienekens 2011). These componets of the value

chain were illustrated in Figure 4 below. The horizontal and vertical structure of the chain characterizes the network structure. A good value chain governance ensures that interactions between firms along the value chain are efficient (Gereffi et al. 2005). There are five types of governance, from low coordination level to high coordination level, including market, modular, relational, captive, and hierarchy (Gereffi et al. 2005). Value added is created at different stages and by different actors throughout the value chain. The schematic (conceptual) framework of the value chain analysis in Figure 4 generally demonstrates the main components of the value chains from the tree producer (farmer in this case) to the end consumer, which could be national or international consumer and their integration in the system (i). It starts from the tree grower and then goes through a process of harvesting, cutting, processing, and transporting to the local and national markets. It also clearly shows how governance and mechanisms of access (iii) shape the transformations of products, value added, and benefit distributions (ii) in the chain. The performance of the value chain is influenced by the immediate environment and the wider environment (iv). The immediate environment directly interacts with the chain actors or the system and affect its performance. It includes the basic inputs, existing regulations and interventions carried out by public service providers or development agencies. While the wider environment interacts indirectly with the chain actors and greatly influence the ability to compete in the markets.

The basic input resource includes land, labour, financial capital, knowledge, technologies, information, and materials and equipment. Regulating environment includes laws, taxation, license and permits, informal rules and regulations and standards. Public funded intervention includes business development services, financial services and promotional activities. On the other hand, the wider environment includes monetary and fiscal policies that determine the availability of low-interest credits and prices stability, infrastructure which greatly influences the availability, delivery times and costs of products, education and training, information etc. Analysing the immediate and wider environment helps to understand the opportunities and the underlying constraints in the chain. This, on the other hand, helps to understand and analyse the options that need to upgrade the chin process (v). Within the market system, different market players are directly engaged in business transactions. Many of the actors in the chain involved in the whole production and marketing process are subjected to the influence of power, relationship, linkage, regulatory laws, policies and informal rules. The presence and absent of different functional supports and services like training, promotional activities, incentives and others into the system through Government, NGO`s, and other private companies affect the chain process.

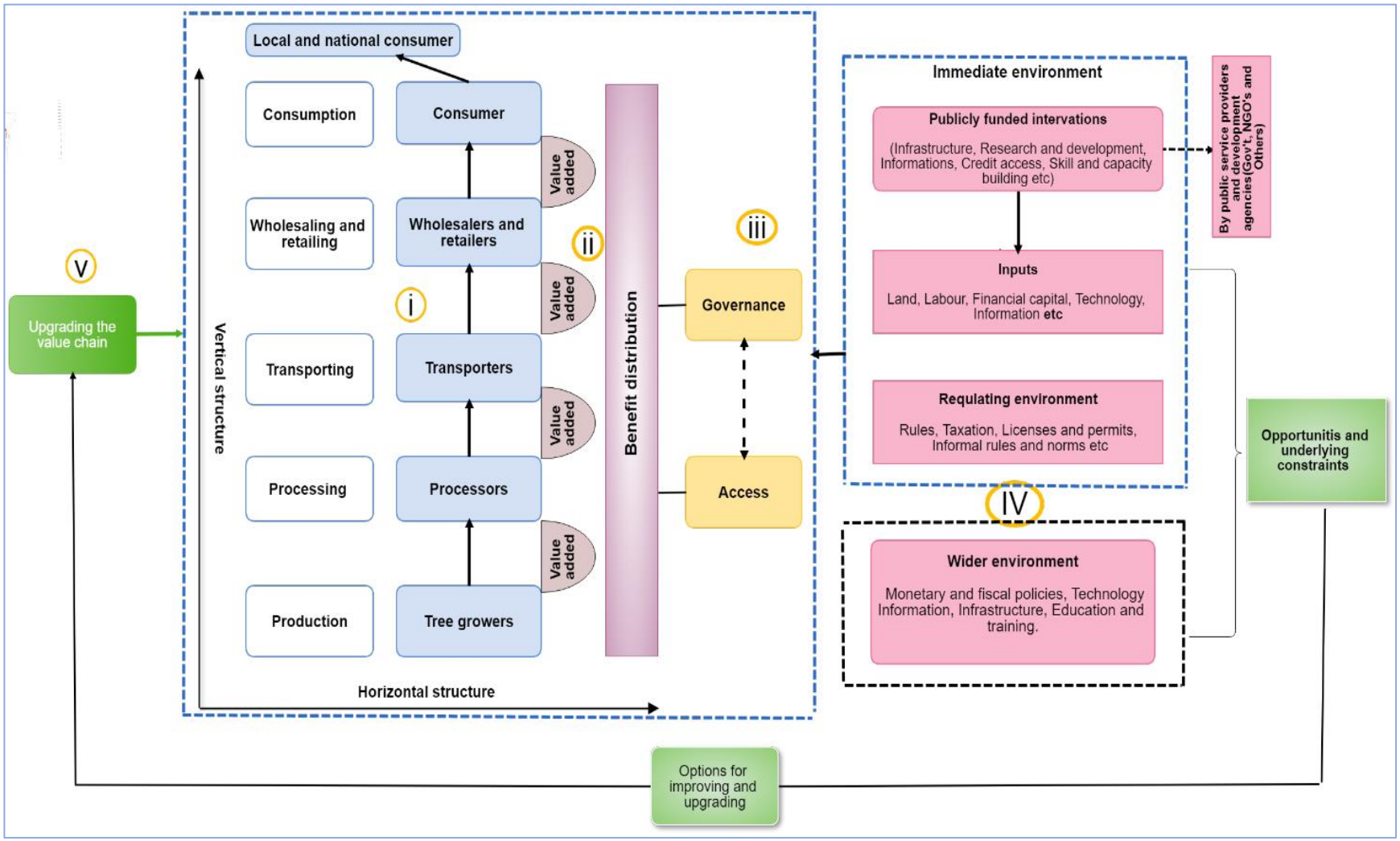


FIGURE 4: CONCEPTUAL FRAMEWORK OF VALUE CHAIN ANALYSIS ADOPTED FROM (RIBOT (1998), KAPLINSKY AND MORRIS (2001), RIBOT AND PELUSO (2003), GEREFFI ET AL. (2005), HERR (2007), TRIENEKENS (2011), ISLAM (2014), ILO (2015).

# CHAPTER THREE

# 3 RESEARCH METHODOLOGY

## 3.1 Description of the study area

The Federal Democratic Republic of Ethiopia is administratively divided into nine regional states and two administrative councils. Southern Nations, Nationalities and Peoples Region (SNNPR) is one of the nine regional states. SNNPR is again divided into fourteen administrative zones, one of which is Sidama (Abele and Tewodros 2017). Sidama zone is again divided into 19 Woredas (Lower administration areas) for administrative purpose. They are namely: Hawassa Zuria, Malga, Wondo-Genet, Gorche, Wonsho, Chuko, Loka-Abaya, Bursa, Bona-Zuria. Chire, Shebedino, Dale, Aleta-Wondo, Dara, Hula, Aroresa, Bansa, Arbegona and Borecha Woredas. Sidama is located in the North-Eastern part of the region and bounded by Gedio zone in the South, Wolaita zone in the West and Oromia in the North East and South East (Abele and Tewodros 2017).

Based on projection population data made by the central statistical agency, the District had a total population of. 148,175 in 2017 (CSA 2007). Hawassa Zuria District has an area of 22,843 ha. It is divided into 23 kebeles (smallest administrative area) and among them is Chefasine kebele, which this research focused on. Chefasine kebele is located at 6°55'58.6"N latitude and 38°29'48.8"E longitude, North Eastern part of Sidama zone (fig. 5). The kebele covers an area of 1,040 ha with an estimated population size of 12,366 people living in 1,110 households and among these, 97% are male-headed (Shibire 2017). Its mean altitude ranges from 1,820 to 1,870 meters above sea level and the average annual rainfall ranges between 900-1400 mm. The mean annual temperature varies from 23-27$^0$C. The area is categorized under dry Woina-Dega (mid-altitude) Agro-climatic zone and the rainy season extends from March to September (Shibire 2017). The study area (Chefasine kebele) was selected due to the high involvement of tree growers in *Eucalyptus* planting by converting their farming lands of khat, coffee and enset (fig. 6). The past research conducted by Shibire (2017) found out a gap of research on the value chain aspect and recommended a study on the value chain of *Eucalyptus* product in the area for the improvement of the value of *Eucalyptus* and ensure equal benefit sharing in the value chain. Besides, value chain studies of wood products were the focus of the WoodCluster project[1] in Chefasine to narrow the supply and demand gaps of wood products. The reason for the focus of the project at Chefasine was the demand for wood and the presence of small-

[1] WoodCluster is a joint project of TU Dresden and three institutions in East Africa: Ethiopia (HU-WGCF & NR), Tanzania (Sokoine University of Agriculture) and Uganda (Makerere University). It has the objective of reducing the wood demand gap of these three east African countries by elucidating sustainable solutions for the problems.

scale farms with woodlots. Therefore, all this and other factors like the accessibility of the kebele have initiated the researcher to select the study area.

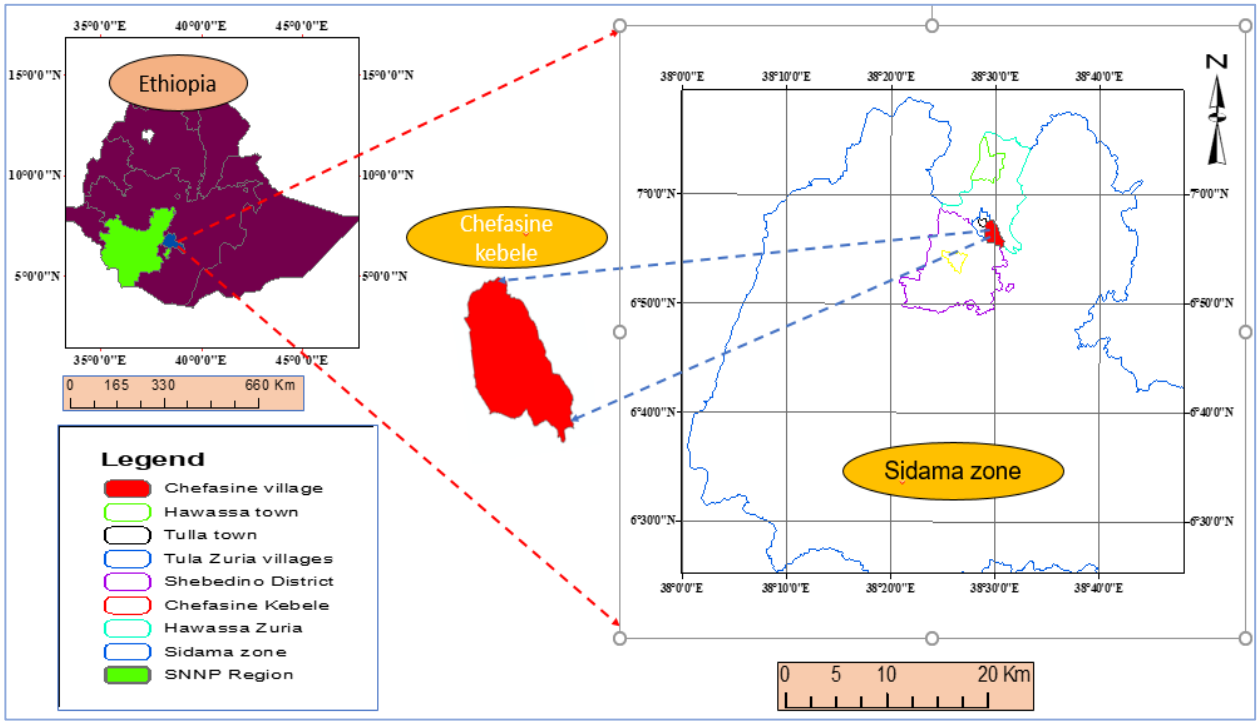


FIGURE 5. MAP OF *EUCALYPTUS* PRODUCTION AND MARKETING AREAS, ORIGINATING FROM CHEFASINE KEBELE (SOURCE: AUTOR (2018)).

## 3.2 Agriculture and land holding size

In the Southern region, agricultural production is the predominant activity, which includes both plant growing and livestock rearing. The main farming practices in this area are diverse, intensive and well-established traditional farming (agroforestry). In every Woredas of the Sidama zone including Chefasine kebele, enset, coffee and khat production activities for household consumption as well as for commercial purposes are the main practices that local farmers depend on. A significant area of the Sidama land produces coffee and enset. Coffee (*Coffea arabica*) is the major cash crop in the region and the leading coffee producing area in the country, contributing significantly to the foreign exchange of the country (CSA 2007). Enset (*Ensete ventricosum* (Welw.) Cheesman) is the single most important root crop grown and the bulk of the population depends heavily on it for survival. Khat (*Catha eduli)* is an important cash crop which is the second largest export commodity and replacing coffee and generating high revenue for the farmers (Woldu et al. 2015). Because of population size, the landholding size of the individual peasants in most parts of the Sidama zone is small. According to Abele and Tewodros (2017), about 53 percent of the farmers own less than one hectares of land, 42 percent of the farmers own one to two hectares of land and only 5

percent own two hectares and more. The average landholding size in Chefasine kebele is 0.8 ha where the minimum and maximum land size owned by the household is 0.25 and 4 ha, respectively (Shibire 2017). In Chefasine kebele both annual and perennials crops such as maize, barley, enset, haricot bean and coffee are produced. *Eucalyptus* is the dominant tree species planted as a woodlot in Chefasine kebele (Shibire 2017) and currently highly planted on areas of khat, coffee and enset (fig 6).


FIGURE 6. *EUCALYPTUS* COPPICE STANDS (LEFT) AND COMBINED GROWING OF KHAT, ENSET AND *EUCALYPTUS (RIGHT)*.

## 3.3 Research design

Value chain analysis depends on multiple sources of data, for a deeper understanding and investigation of the whole process, for actors involved, and for complex issues in the system. The case study approach is an effective approach to conduct such types of research (Zainal 2007). According to Yin (2003), a case study research method provides holistic and meaningful information about the characteristics of real-life events. Besides, the approach helps to find intensive qualitative and quantitative data sets. Therefore, this study was conducted as a case study, for the exploration of the value chain of *Eucalyptus* pole and fuelwood in Chefasine kebele, Sidama zone. This research work was done in three different phases including pre-field, during field and post field stages. In the pre-field stage, different desk-based activities such as problem identification, objective formulation, and developing the overall proposal including approval of the proposal were undertaken. The second phase was the main fieldwork process. The major activity in this phase was field data collection in the study area and was carried out from the first week of March to the beginning of May 2018. Before the fieldwork, different discussions aiming to address the objectives and importance of the research work was carried out with the Chefasine kebele administration and agricultural office and WoodCluster project coordinator in Ethiopia. After consultation and getting permission from the concerned body, a reconnaissance survey was done for the selection of potential tree growers. The third

phase of this research was data analysis and presentation. Different methodologies were used for the analysis and presentations of data. Figure 7 shows an outline of the steps followed during the research process.

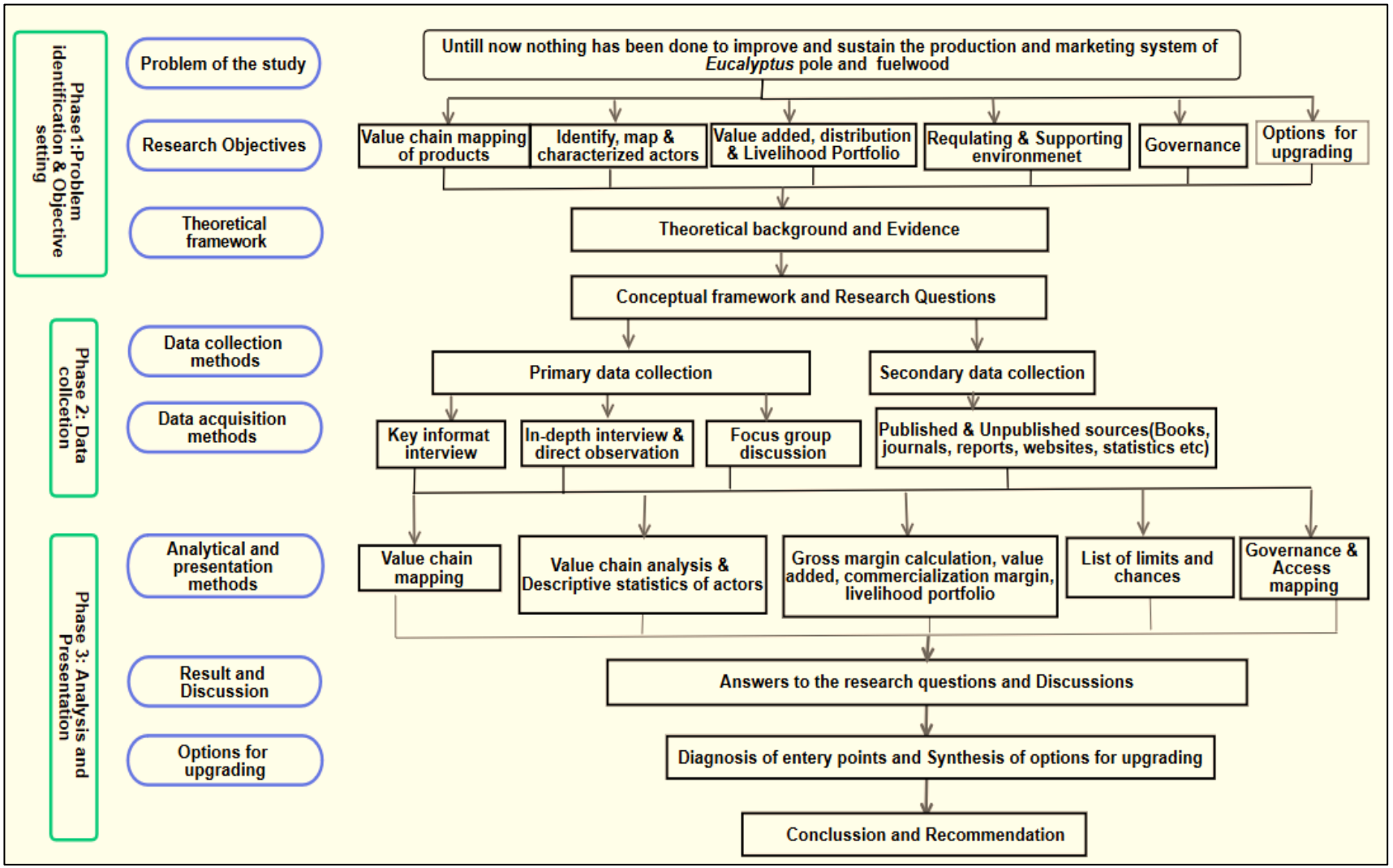


FIGURE 7: A SCHEMATIC DIAGRAM OF THE RESEARCH METHODOLOGIES APPLIED (SOURCE: AUTHOR, 2018)

## 3.4 Sources and methods of data collection

### 3.4.1 Primary data collection

To collect the primary data, various tools were used. These include: key informants' interview, in-depth interview, direct field observation, market assessmentt, focused group discussions and Participatory Innovative platform (PIP). Both quantitative and qualitative data were gathered. Semi-structured questionnaires (Appendix I) were developed to conduct the interviews. Semi-structured questionnaires give the interviewees a chance to express themselves as much as possible (Montello and Sutton 2006). Prior to the interview, pre-testing was done on randomly selected tree growers. Besides, a consultation was made with the representatives from the village and development agent workers (DA's) about the general condition of the village before the real data collection starts. This ensured a common understanding of all questions among interviewers. Then, the initial questionnaires were revised by considering the information provided by a few selected tree growers for pre-testing.

**Key informant interview:** Key informant interview was done with structured questionnaires, semi-structured questionnaires and unstructured talks. A key informant who had a general knowledge about the farming practices of *Eucalyptus* plantation, poles and fuelwood production and marketing were given priority for selection. Chefasine kebele agricultural experts were visited to provide first-hand information about *Eucalyptus* plantation, poles and fuelwood production and marketing in the study area. A total of 10 key informants' interviews, three from Chefasine kebele agricultural expertise, two from pole wholesalers and retailers and one from a middlemen who have more than 10 years of trading experience, one from Hawassa Ministry of Environment, Forest and Climate Change, one from wood product factory at Hawassa and two from the tree growers, who have long standing experience in production and marketing of *Eucalyptus* were contacted.

**In-depth interview:** The in-depth interviews were used to collect primary data from value chain actors. The interview was based on the semi-structured questionnaires. Both open and closed-ended questionnaires were used and tailored accordingly, targeting the different actors. A total of 49 respondents along the chain were interviewed including tree growers, middlemen, broker, transporter, constructor, carpenter and wholesalers and retailers of the pole at Tulla and Hawassa. Also, workers, brokers, large and small fuelwood wholesalers and retailers were interviewed (Table 5). The characteristics, function, organization and chain of the actors, quantity, cost and price of inputs and outputs, process at each stage of the chain, the role of *Eucalyptus* pole and fuelwood business for actor's livelihood strategy and challenges and constraints for *Eucalyptus* business was the focus of the in-depth interview (questionaries' for the in-depth interview were found under Appendix I).

**Market assessment**: To capture the price of selected crops a market survey was conducted, in addition to the key informant and in-depth interviews. To determine the buying and selling price of a tree: First, the number of trees per area of *Eucalyptus* stands for each tree grower were estimated from the total trees per hectare. Second, the amount of revenue that the tree growers have received from the specified area of *Eucalyptus* stands recorded (here, the actual money that they received has applied If they sold within the past two years, if not, with the help of Chefasine pole retailers, the price of the stand was estimated). Then, price per tree was estimated by dividing the amount of revenue that they gained from the specified area of *Eucalyptus* woodlot with the number of trees per area of *Eucalyptus* stand. Moreover, the amount of income that they received from the *Eucalyptus* stands was divided by the average number of trees per specified area of *Eucalyptus* and then the value was expressed per hectare. Besides, pole wholesalers and retailers and middlemen, brokers as well as constructors were interviewed about the cost of a hectare of *Eucalyptus* and cross-checked. Market price was used to estimate the selling price of the traders (wholesalers and retailers of pole and fuelwood). The summary of the average market price of *Eucalyptus* poles was given in Table 3 and the detailed was provided in Appendix IV. The market price of truck loads of poles and donkey cartloads of fuelwood was assessed to determine the selling price of the middlemen and buying cost of wholesalers and retailers of pole and fuelwood. It means, the selling price of the former actors were considered as the buying cost of the succeeding actors.

On average a pole costs US $ 0.48 (13 ETB[2]), 1.03 (28 ETB), 1.36 (37 ETB) and 1.76 (48 ETB) at the tree growers level, Chefasine kebele, Tulla and Hawassa towns, respectively. A truck of poles (550 poles) valued US $ 514 (14,000) to 734 (20,000 ETB) (Appendix II), depending on the quality of wood, season, market demand and cost of transportation. On average a truck of poles was valued at US $ 624 (17,000 ETB), which means US $ 1.12 (31 ETB).

Table 3. Average selling price of *Eucalyptus* poles at different nods of *Eucalyptus* poles value chain.

| Nods | Tree growers | Chefasine retailers | Middlemen | Tulla pole wholesalers and realises | Hawassa pole wholesalers and retailers |
|---|---|---|---|---|---|
| Average selling price of pole at each nod (ETB) | 13 | 28 | 31 | 37 | 48 |

[2] ETB (Ethiopian Birr) is the currency of Ethiopian (1 ETB =0.0367 US $ or 1 US $=27.2501 ETB) on 24th of May 2018. (https://www.currencystats247.com/currencies/etb-usd/2018: 24 May, 2018).

**Direct (field) observation:** It is the process of recording the behavioural patterns of people, objects and events in a systematic manner. In this method, many different process and activities of production and trade of *Eucalyptus* products more emphasis on pole and fuelwood were directly observed on the field. The observation was unstructured and undisguised in the pole and fuelwood selling and production sites and photos were taken using a digital camera. The record includes the process of pole and fuelwood production, harvesting, storing, the process of transportation, selling etc.

**Focus group discussion:** Focus group discussion was conducted at tree grower and trader levels. A total of two focus group discussions, one at the tree growers' level and the other at the wholesalers and retailers' level of pole and fuelwood was conducted. A total of 10 tree growers were involved, from men, women and youth groups at the tree grower level. The second focus group discussion was carried out with five wholesalers and retailers of pole and fuelwood at Hawassa town. The discussion was focused on the production of *Eucalyptus* pole and fuelwood, the status of *Eucalyptus* woodlot management in the area, the role of *Eucalyptus* pole and fuelwood for livelihood activities (income, education, healthcare etc.), the types of governance and coordination that existed in the chain and constraints and challenges facing actors in the chain and possible future options to upgrade the chain. Focus group discussion of the wholesalers and retailers were conducted in the marketplace by using their free time. Woreda agricultural experts (extension agents) were participated in the discussion and were asked to select the people for discussion.

**Participatory Innovative platform (PIP):** Participatory innovative platform workshop, which was organised by the WoodCluster project at Hawassa town, from on June 04, 2018 were used as one of the primary data collection methods. PIP is a participatory approach, which helps to make the value chain actors part of an innovation system (Asmamaw and Auch 2016). Actors from tree grower, middlemen, wholesaler and retailer of poles and fuelwood, transporter, broker, constructor and carpenter as well as government representative from Chefasine kebele, researchers from Wondo Genet College of Forestry and Natural Resource and wood processing experts from Hawassa town participated in the workshop. In this method, discussion was made on the survey results as well as problems and challenges. Alongside, the possible options to solve the identified problems and challenges for each actor level in the chain were proposed.

### 3.4.2 Secondary data collection

**Literature and data collections:** Secondary data were collected from literature and other researchers' findings. Chefasine village administrators, Hawassa Ministry of Environment, Forest and Climate Change (HMECC) and Hawassa City Revenu and Customs Authority (HCRCA), were contacted to gather information about trade and production of *Eucalyptus* pole and fuelwood and possible options for upgrading the chain. Moreover, results from the PIP workshop were used for the identification of the upgrading option.

The record also includes taxes, fees, prices and other related matters. Besides, published reports and previous research works were used to gather information.

**Woodlot structure and performance:** Data for the woodlot structure and performances such as growth dynamics (DBH and height) and others were sourced from the research conducted by Thiem (2018), on woodlot performance of *Eucalyptus* from Chefasine kebele.

The number of *Eucalyptus* trees per hectare was estimated in different ways. Firstly, locations of *Eucalyptus* trees belonging to interviewed farmers were marked using a GPS device in order to quantify the overall stand. Then, *Eucalyptus* trees belonging to eight farmers were randomly measured to determine the spacing. The result founds different and irregular spacing types (Table 4). Then, the number of trees per unit area of the tree growers and then per hectare estimated.

Table 4. Spacing used for plantation establishment of *Eucalyptus* woodlot.

| No | Spacing used during woodlot establishment | | Area per tree ($m^2$) |
|---|---|---|---|
| 1 | 0.25 | 0.25 | 0.06 |
| 2 | 0.70 | 0.75 | 0.53 |
| 3 | 0.50 | 1.50 | 0.75 |
| 4 | 0.75 | 1.50 | 1.13 |
| 5 | 1.50 | 1.00 | 1.50 |
| 6 | 0.25 | 0.50 | 0.13 |
| 7 | 0.50 | 0.50 | 0.25 |
| 8 | 1.70 | 0.50 | 0.85 |
| Mean | 0.77 | 0.81 | 0.62 |

In addition to this, middlemen and pole wholesalers and retailers in Tulla gave information of the number of truck-loads of *Eucalyptus* poles obtained from a woodlot as well as the number of different poles assorted to cross-check the number of trees per hectare.

## 3.5 Sampling method and sampling procedures

Value chain is a network of activities carried out by different agents in the chain. It is a framework used for organising and analysing information to create value in a network of activities carried out by different actors. To undertake such types of research Mccormick and Schmitz (2002) used snowball and purposive sampling methods to identify actors and informants. Thus, this study employed nonprobability sampling for identifying informants for the interviews. Tree growers from Chefasine kebele were selected purposively, if they had a *Eucalyptus* plantation. The selection of tree growers was done in a reconnaissance's survey with the help of the agricultural expertise. During the reconnaissance survey, the name of active tree growers on production and marketing were recorded. For value chain study, the point

of entry is a crucial stage as the value chain is a network and series of different activities and actors (Kaplinsky and Morris 2001). Tree growers were the point of entry for this study and thus filed work was started from the tree grower and continued up to the consumers (contractor and carpenter). In social survey research studies, the richness of the data collected is much more important than the number of respondents or participants (Tuckett 2004). A common range of the number of participants in qualitative studies is somewhere from 8 to 15 participants, and occasionally it varies both inside and outside of this range. For example, Creswell (2007) recommends 3–5 participants for a case study, 10 for a phenomenological study and 15–20 for grounded theory study. This research followed a case study research approach and by considering the limitation of time and financial constraints, a total of 49 respondents were interviewed (Table 5). Among these, 20 of the respondents were tree growers from Hankemo (3), Belamo (6), Argeta (5), Butelo (4) and Ura (2) sub-villages. Although samples for the tree growers were selected purposively and the richness of the data is much more important than the sample size used, however, in this study, the sample was considered acceptable as it represents more that 10% of the total tree growers (150 tree growers) in the village.

Table 5: Summary table for the number of respondents for *Eucalyptus* pole and fuelwood originated from Chefasine Kebele.

| Value chain node | Estimated number. of actors | Number of respondents | Sampling method | Remark |
|---|---|---|---|---|
| Producer/woodlot/tree growers) | 150 | 20 | Purposive selection | Reconnaissance survey |
| Brokers | 2 | 2 | Referral from the tree grower | Snowball sampling |
| Middlemen (2 poles and one fuelwood) | 3 | 3 | Referral from the tree grower and brokers | Snowball sampling |
| Tulla pole wholesalers and retailers | 7 | 7 | Referral from the middlemen, tree grower and broker | Snowball sampling |
| Hawassa pole wholesalers and retailers | ≥45 | 6 | Referral from the middlemen | Snowball sampling |
| Large fuelwood wholesalers and retailers | 4 | 3 | Referral from the middlemen | Snowball sampling |
| Small fuelwood retailers | 2 | 2 | Referral from the large fuelwood wholesalers | Snowball sampling |
| Labourers | - | 4 | Referral from traders | Snowball sampling |
| Transporters and constructors | 4 | 2 | Referral from traders | Snowball sampling |
| **Total** | **>126** | **49** | | |

The actors after the tree grower were selected based on snowball sampling method. Snowball sampling also called chain referral or networking is a non-probabilistic sampling in which persons will deliberately be chosen for sampling are used as informants to locate other persons having necessary characteristics making them eligible for the sample (Bernard 2011; Drăgan and Isaic-Maniu 2012). In this method, the initial respondents were asked to recommend the names of the other possible respondents who have similar activities and related to the subject area. The idea is that a bond or link might exist in between the initial sample and others in the chain. Because of the lack of a sampling frame in snowball sampling, selection of sample was based on referrals. Therefore, in this research, the interview of the succeeding step was the referrals of the preceding step.

## 3.6 Reliability and validity of data

For the sake of quality, testing both the validity and reliability of the data collected is very important. A combination of different methods of data collection tools and multiple sources enables triangulation of the data and thus, ensures reliability and validity of the results. In this research data was collected from various sources and from different actors by using multiple tools and was triangulated adequately. Consultation and discussion with the concerned government offices (Chefasine kebele administrator, Ministry of Environment, Forest and Climate Change and Hawassa City Revenue and Customs Authority) were held to produce reliable information and data for cross-checking information to confirm validity. The data on the product flow, revenue, cost and actors, mechanism of access, regulating and supporting environment, coordination and linkages were collected from different sources through different methods of key informant interview, in-depth interview, direct observation (products, processing and marketing) and focus group discussions at producer and trader level. As well results from the Participatory Innovative Platform conducted by the WoodCluster project and the author were integrated. Besides, market survey (observation when the traders and buyers negotiate and measurement on pole and fuelwood) at Tulla and Hawassa towns were conducted and triangulated to verify the validity and reliability of the data.

## 3.7 Analysis and presentation of data

Both qualitative and quantitative analysis methods were employed to analyze and present the data. Value chain analysis, the theory of access and value chain governance was adopted for the analysis of the information (Kaplinsky and Morris 2001; Gereffi et al. 2005). Value chain analysis as a tool is essential in understanding the sequence of related business activities from production to consumption of *Eucalyptus* products in general and pole and fuelwood in particular. Detailed explanations for the analysis methods used are found hereafter.

### 3.7.1 Value chain mapping of *Eucalyptus* products

Chain mapping is the first step of a value chain analysis (Faße et al. 2009; Springer-Heinze 2017). At this stage, the sector was illustrated in a map-like-fashion tracing the product flows within the chain. The objective is to give an illustrative representation of the identified chain actors and the related product. The mapped value chain shows the actors, their characteristics, relationships, and economic activities at each stage (Faße et al. 2009; Kaplinsky and Morris 2001).

### 3.7.2 Quantifying the value chain

The next step after agreeing upon the actors was quantifying the value chains in detail. It helps to the better understanding of the overall economic significance and to identify intervention priorities and opportunities. Quantifying the value chain indicates the addition of quantifiable data about volumes and turnover, prices paid at each chain link between stages, shares of product flow of the different chains or distribution channels, the chain supporters and suppliers, and the employees (Faße et al. 2009).

### 3.7.3 Economic analysis of the value chain

The third step focused on economic analysis of the value chains and it complemented and deepened the quantification with more emphasis on economic efficiency. In this stage, the flow of revenues accumulating at various stages of the value chain was examined in regard to (i) income and margin, price and quantities of the poles and fuelwood handled by the different actors (ii) distribution of revenue and margin among and within the groups along the value chain (Bockel and Tallec 2005; Marshall et al. 2006). Meanwhile, assessing the cost structure allows the identification of critical points that need an investigation (Springer-Heinze 2017). The main emphasis here was to compare the distribution of costs, revenue, value-added, and margin among actors. At each stage of the chain gross profit margin was used to evaluate the benefits of the commodity chain and calculated by the following formula (https://www.investopedia.com/terms/g/gross_profit_margin.asp#axzz1ukMcMM9q, 30 June, 2018).

$$Gross\ profit\ margin\ (\%) = \frac{Revenue - Cost}{Revenue}\ x\ 100 \qquad \text{.....equ. 1}$$

Where Revenue = Sale volume x Unit price; and cost (the cost of goods sold) = Variable cost + Fixed cost

Variable costs are those cost which varies with production volume and included seed, fertilizer, seedling, labor, transport costs etc. On the other hand, fixed costs are those costs which do not vary with production volume and depreciated. For example, tools, interest, tax etc. Besides, product cost, processing cost, official fees, and other unofficial charges were used in the cost function. Product costs are the costs of products of *Eucalyptus* (poles and fuelwood) per truck and donkey cart loads. Processing costs included transportation and communication costs (mobile balance).

The market price was used to determine the cost of some of the resource. However, for family labour, which is difficult or not possible to price using the market, the opportunity cost of the labour was used. The opportunity cost of labour is the income foregone by not working on the farm or by not using farm labour in some alternative enterprise on the farm. According to Harberger (1971), the measure of opportunity cost is "the supply price of marginal units of labour for given skill characteristics and labour market areas where the workers will work and live." For this study, the cost of a unit of unpaid labour used in the farm measured by the supply price or market price of labour for a similar task in hired employment. Next, to this, the value added in each stage was calculated. It is the "difference between the sale price of goods sold and the cost of materials and supplies used in the production" (Klemperer 1996: p.573) (cited by Auch (2017) in his lecture note).

$$VA = Y - II \quad \text{.....equ. 2}$$

Where VA= value added, Y= sell price of goods sold and II= cost of intermediate input (cost of materials and inputs used in the production process).

The value added at each stage (VAi) of the value chain was calculated by subtracting the value of intermediate inputs used at each respective stage (IIi) of the chain from the value of a product at a given stage (Yi)

$$VAi = Yi - IIi \quad \text{.....equ. 3}$$

Where VAi = value added at the $i^{th}$ stage; Yi = output from segment/stage i; and IIi = intermediate material used in stage excluding the product from the previous stage, used in stage i.

Therefore, the total value added in the entire chain was the summation of the value added for each step of the chain or node (Faße et al. 2009). Which is express by the formula as follow.

$$\text{VA chain} = \sum(VA1 + VA2 + VA3 \ldots VAn) \quad \text{eqn. 4}$$

Where VA chain= total value added in the entire chain and VA is the value added at each node of the chain.

Value added distribution is used to understand the contribution of the system in the local economy and employment generation (Auch 2017; lecture note). Thus, the value-added distribution is depicted by separating into the net benefit of actors, the wages and salaries and taxes and other fees. However, the accurate value-added calculation at a given nod (actor) requires detailed information from bookkeeping (Auch 2017; lecture note). By considering the above definition, the following formula was used to estimate the distribution of the value added.

| Value added (VA) = margin + wages + taxes | ---------- Equ.5 |
|---|---|

**Commercialization Margin:** Commercialisation margin was calculated as an indicator for the distribution of benefit along the chain. It indicates how much of the final sales price is obtained by an actor in the value

chain. It also shows the proportion of the last unit price received by a given actor in the chain, giving a sense of how equitably the profit is divided (Marshall et al. 2006).

It is expressed as follows: -

$$\text{Commercialisation margin} = \frac{\text{Sale price} - \text{Purchase price}}{\text{final product price}}\ x\ 100 \quad \text{..... equ. 6}$$

### 3.7.4 Role of *Eucalyptus* pole and fuelwood for actor's livelihood strategies

The data for livelihood activities were collected using livelihood portfolio. The assessment based on how *Eucalyptus* pole and fuelwood production, processing and marketing influence the wellbeing of the actors in the chain. Gross margin was used to analyse the income contribution of different livelihood strategies. Besides, the resilient strategy of the livelihood was used to understand the role of *Eucalyptus* pole and fuelwood for actor's livelihood.

**Gross margin calculations:** Gross Margin (GM) is a method used to assess the profitability of a business. It is obtained by finding the difference between the gross income accumulated and the variable costs incurred.

$$\text{Gross margin} = \text{Gross income} - \text{Variable Costs} \quad \text{..... equ. 7.}$$

Where: Gross income is obtained by multiplying the gross output (yields) by the "farm-gate" price received for the product. The costs for the establishment of perennial crops were obtained from the entire expected lifespan of the crop using the formula given by Upton (1973) cited by (Ndegwa 2010).

$$CA = \frac{(Q*P)*[r\ (1+r)^n]}{[(1+r)^n - 1]} \quad \text{..... eqn. 8}$$

Where: CA= constant annuity, Q=Quantity (number of trees), P = Price per unit, r = interest rate, n = Life expectancy of the crop in years. The lending or borrowing rate of Ethiopia (7%) as by May 2018 was used as an interest rate.

### 3.7.5 Regulating and supporting environment

The regulating environments including formal regulations like permits, tax etc and informal rules like norms and supporting environments including all kinds of support like state extension, research, NGO, associations etc of the chain was elaborated and described based of the information collected through in-depth interview, key informant interview and focus group discussions. In this stage, the critical points of the business environment affecting the performance of the value chain were identified and analysed by listing the limits and chances in the chain.

### 3.7.6 Mechanism of access

Here, different mechanisms of access used by different actor groups to gain control and maintain access to benefit from the *Eucalyptus* pole and fuelwood business analysed by using information from focus group discussion and in-depth interviews.

### 3.7.7 Mechanisms of governance

For the analysis of the governance pattern of chain actors in the *Eucalyptus* business, information's on the coordination, linkage and regulation was collected and analysed. The information gathered included aspects such as: who determines the price, how power is maintained and controlled, how the negotiations and exchanges take place, how are the relationship and linkages, and what are the factors that determine the relationships and linkages in the chain? (Gereffi et al. 2005; Abtew et al. 2012). Locally set indicators such as (degree of task complexity, knowledge of product and process, degree of dependency, easiness of information flow, mode of price determination, mode of communication, simplicity of exchange of products, ability of basic market infrastructure, market information, access to capital, service feeding in to the system etc) were considered to evaluate the three variables of governances (complexity of transaction, ability to codify transaction, and the capabilities of suppliers as defined by Gereffi et al. (2005). Then the five types of governance, namely; markets, modular value chain, relational value chain, captive value chain and hierarchy were elaborated, and the governance type of *Eucalyptus* pole and fuelwood distinguished based on the three variables of governance.

### 3.7.8 Identifying options for upgrading

The option to upgrade and improve the chain was analysed first by describing the problems, challenges and constraints in the chain through interviews, observations and group discussions. Then, the obtained results were discussed with the focus group discussion carried at the tree growers' level as well as the traders' level for the identification of upgrading options. The Participatory Innovative Platform (PIP) discussion has been used for the identification of the problems, challenges and possible options for upgrading the chain. Here the issues identified were prioritized and solutions for the determined and prioritized impediments have discussed and documented.

### 3.7.9 Data presentation

The finding of the study was presented and interpreted by using descriptive statistics through tabulation, graphics, empirical data, description of facts and mathematical calculations, using MS Excel, and statistical package for social sciences (SPSS) software windows version 19.0.

# CHAPTER FOUR

# 4 RESULTS

## 4.1 Demographic characteristics of respondents.

Table 6 provides a summary of key socio-economic and demographic characteristics of the tree growers and traders interviewed in Chefasine village, Tulla and Hawassa towns. The age of most of the tree growers (60%) and traders (67%) was in between 18 and 40 years and the rest 40% of the tree growers and 33% of the traders was above 40 years old. Male headed tree growers and traders accounted for 95% and 76%, respectively. This high percentage of male participants in the household survey of tree growers could be attributed to the sampling process, which required that the potential interviewees should involve in *Eucalyptus* production, processing and marketing. It is because the involvement of female-headed households in tree growing was low as compared to male headed households. It is because of the agricultural division of labour (a cultural factor) (Ayele 2008) that exist in the study village and elsewhere in Ethiopia. Accordingly, the requirement could have locked out female-headed households from participating in the survey. However, the participation of female traders (24%) outweighs the proportion of tree grower females (5%). It is because female households do most of the fuelwood wholesaler and retailer jobs. The average household size is about six persons, although the figure ranges from 1 to 12 persons per household. Smaller household sizes are from younger tree growers who have participated in *Eucalyptus* production and marketing but still are not married and therefore without families while other traders had families. In general, about 55% of the tree growers and 72% of traders have attained up to primary school level of education, and 30% of tree growers and 14% of traders have attained secondary education and the rest 15% of tree growers and 14% of traders have attained secondary education.

Table 6. Characteristic of tree growers and traders for *Eucalyptus* products value chain originated from Chefasine

| **Characteristics** | | **Tree grower (20 respondents)** | | **Pole and fuelwood wholesalers and retailers (21 respondents)** | |
|---|---|---|---|---|---|
| | | Frequency | Percentage (%) | Frequency | Percentage (%) |
| **Gender** | M | 19 | 95 | 16 | 76 |
| | F | 1 | 5 | 5 | 24 |
| **Age** | ≥ 18 and < 40 | 12 | 60 | 14 | 67 |
| | ≥ 40 | 8 | 40 | 7 | 33 |
| **Marital status** | Single | 1 | 5 | | |
| | Married | 18 | 90 | 21 | 100 |
| | Widow | 1 | 5 | | |
| **Educational status** | Primary education | 11 | 55 | 15 | 72 |
| | Secondary education | 6 | 30 | 3 | 14 |
| | More than secondary education | 3 | 15 | 3 | 14 |

## 4.2 *Eucalyptus* woodlot and its status

The survey result shows, the majority (70%) of the tree growers started planting *Eucalyptus* in the past 20 years. A *Eucalyptus* tree dating 30 years back was recorded by Thiem (2018). Different ways of *Eucalyptus* planting were observed: (1) boundary plantation including roadside and boundaries of homesteads and around farmland, (2) woodlots on grazing land, unproductive and degraded land. The survey result shows that 50% of the respondents have planted *Eucalyptus* on the boundaries of homesteads and around farmland (fig. 8). The high percentage of a plantation in boundaries is in agreement with a report made by Duguma and Hager (2010) and Abiyu et al. (2015) that boundaries are the favourite tree planting niches. The inclination to plant trees on boundaries of farmland could be the result of low land holding size and fragmentation of lands which will increase boundary areas and respond to the changed tenure system (Abiyu et al. 2015). The other 25% and 20% of tree growers planted *Eucalyptus* on the road side and degraded and unproductive lands, respectively. Only 5% of tree growers plant *Eucalyptus* on their grazing lands. According to the respondent's response and explanation, tree growers planted *Eucalyptus* near to their homestead because of the shortage of land, as land is a limited resource for most of the farmers.

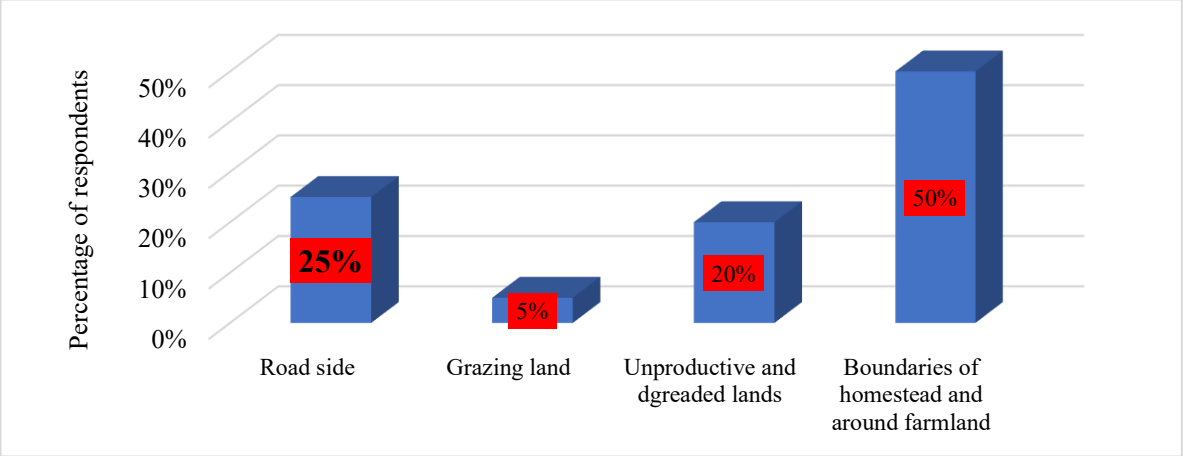


FIGURE 8. TYPES OF *EUCALYPTUS* PLANTATION DESIGNS AT CHEFASINE (SOURCE: THIEM, 2018)

For the kebele, the average total land size of households is estimated at 0.8 hectares, although the size ranges from 0.2 ha to 4.0 ha. It is small as compared to the other farmers in the country, e.g., 1.54 ha per household for the Wogera District in Northern Ethiopia (Oduol and Nang 'ole 2012). It means tree growers are limited by land shortage to expand their *Eucalyptus* stand and obtain a benefit. The average size of a *Eucalyptus* woodlot was 0.36 ha and ranged from 0.1 ha (minimum) to 1.25 ha (maximum). Planting *Eucalyptus* on and around homestead helps the tree growers to monitor the stand frequently and manage it easily. Allocating their limited land for *Eucalyptus* is an indicator of the strong motivation of farmers for planting and managing *Eucalyptus*. *Eucalyptus* woodlots are also located far from a homestead, especially in the case where a larger land area is held and unproductive and degraded land which cannot be used to grow khat, coffee or enset. Currently, most of the woodlots are placed on areas that are not productive for khat and coffee and have been becoming degraded (fig. 9).

FIGURE 9. CURRENT WOODLOT PLANTATION AREAS IN CHEFASINE VILLAGE (PHOTO: THIEM, 2018)

A questionnaire was developed and asked to know the tree grower's motivation towards *Eucalyptus* planting and management (fig. 10). The result shows, tree growers have been motivated to plant *Eucalyptus* due to its price raise (31%), fast growth rate (23%), easy and less costly to manage (19%), low labour and input cost and requirement (14%), low level of risk (10%) as well as decline of land productivity for khat and coffee farming practices (3%).

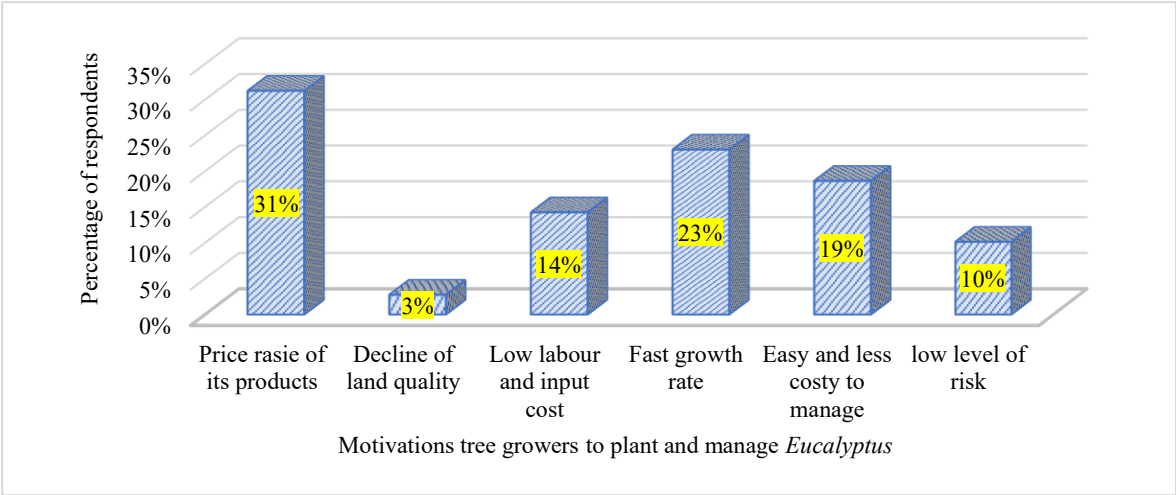


FIGURE 10. MOTIVATION OF TREE GROWERS OF CHEFASINE TO PLANT AND MANAGE *EUCALYPTUS*.

Once after planting, the usual way that was observed in the area is managing and utilising it for serval years through the coppice stand management system. However, it is known that the productivity of the coppice stand might not be consistent for a long period. In the first years, it is expected to have a certain amount of growth, increased and reaches its maximum growth. After that, it started to decline again due to several reasons. The reason could be old stocks are not that vital anymore, and no fertilising and poor soils may lack nutrients with time. The growth of *Eucalyptus* regarding volume (growing stock) for different rotation periods was observed (fig. 11). In the first rotation, the growth of *Eucalyptus* was 95 $m^3$ per hectare at the age five, and for the second, third and fourth rotation periods the growth was approximated to 177, 190 and 181 $m^3$ per hectare, respectively at the age of five. During the fifth and

six rotation periods, the growth of *Eucalyptus* become 60 $m^3$ and 44 $m^3$ per hectare at the age of five years, respectively. This situation was also observed by Zewdie et al. (2009) in the central highlands of Ethiopia. According to Zewidie et al. (2009), there were decreasing trends of biomass production with consecutive cutting cycles. The reason for the decrement of productivity with the increment of rotation cycle in the study kebele could be the loss of the vitality of the stump as the stand gets older and older.

Moreover, the absence of soil loosing, fertiliser application, proper thinning, improper cutting position and tools used could have their impact on the reduction of growth through time. For example, harvesting activities were done by using axe where the tree is cut at either too high from the ground or at the ground level. It affects the regeneration and survival of shoots from the stumps/stocks. Thus, managing *Eucalyptus* stand for four rotation periods and changing the land use type could be beneficial for the tree growers of Chefasine. Dessie and Erkossa (2011), on planted forests and trees working paper of *Eucalyptus* in east Africa, recommended replacing the coppice crop with seedlings after 3-4 coppice rotations. However, it brings the additional cost of labour for extracting the old stump. Proper planning of spacing before planting could be a solution to this problem.

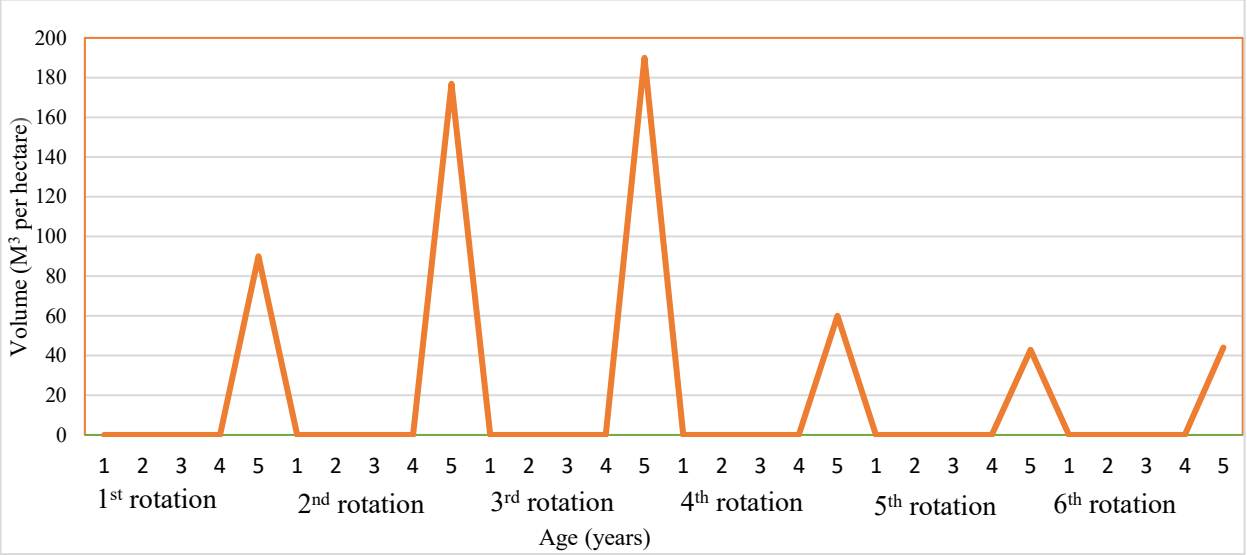


FIGURE 11. VOLUME DISTRIBUTION OF *EUCALYPTUS* AT THE AGE OF FIVE FOR DIFFERENT ROTATION PERIODS (SOURCE THIEM 2018).

## 4.3 *Eucalyptus* products from Chefasine

*Eucalyptus* is used for a wide range of products, including poles, splitted poles, fuelwood, charcoal, seed, branches, leaves and twigs. During the key informant interviews and focus group discussions carried out in Chefasine village, the products were ranked regarding the importance, frequency of use and source of income to the household (Table 7). Almost all (100%) of the tree growers in Chefasine sold their *Eucalyptus* stands as standing tree to the buyers. From the harvest, 94% (85% pole, 4% splitted wood and 5% fuelwood) of the wood directly delivered to the towns (Hawassa and Tulla towns)

and 6% of the products consumed locally (fig. 12). The data suggest that among the *Eucalyptus* products produced by the tree grower, seed, branches and twigs including leaves are not sold.

Table 7. Ranked *Eucalyptus* products from Chefasine Kebele.

| No. | ***Eucalyptus* products** | **Rank based on income and frequency of use.** |
|---|---|---|
| 1 | Poles | 1 |
| 2 | Splitted poles | 2 |
| 3 | Fuelwood | 3 |
| 4 | Branches and twigs including leaves | 4 |
| 5 | Seeds | 5 |

**Poles:** are the most important products of *Eucalyptus* and has a variety of functions including construction, scaffolding, fencing, making different farm and household tools and power lines. It is used for both local and modern (scaffolding) construction, fencing, and creating different farm tools. Immediately after the delivery of this products to the pole wholesalers and retailers, poles are assorted in different pole types (Table 8) depending on the size (diameter and length) and quality of the wood as well as on the function of the wood. The different assortments in Amharic includes: Ye Wuch Gedegeda Mager (የዉጭ ግድግዳ ማገር), Ye Wuste Gedgeda Mager (የዉስጥ ግድግዳ ማገር), Qesete (ቅስጥ), Weraje (ወራጅ), Gureshume (ጉርሹም), Ye Qoreqoro Magere (የቆርቆሮ ማገር), Teshegagari (ተሸጋጋሪ), Felete (ፍልጥ), Aerecho/Chefeka (ጨፈቃ) and Bark and Branch in bundles (ባርክ/ቅርፊት). The different parts of *Eucalyptus* poles have distinct functions as illustrated in Table 8. From the survey, it is confirmed that, in the village, there is no standard to determine the rotation period of *Eucalyptus* stand. Tree growers in Chefasine start to sell their stand from age 3, depending on the immediate cash need of the tree growers. According to Zerihune Gezahegn (2010) in Ethiopia, *Eucalyptus* species starts to generate income to farmers from the age of 3-4 years onward. In the study area, tree growers sell their stand at the age of 3 and 4 years for construction (Aerecho/Chefeka, Ye Wuch Gedegeda Mager, Ye Wuste Gedgeda Mager and Ye Qoreqoro Mager) purpose and at the age of 5 - 8 years for commercial and construction poles like Gureshume, Qesete, Weraje and Teshegagari.

Table 8. Different assortment of *Eucalyptus* poles and their expected harvesting time for planting and coppicing stand.

| Different assortment of *Eucalyptus* (Amharic Name) | Use to fix or connect | Length | Diameter | Quantity | | Years after | |
|---|---|---|---|---|---|---|---|
| | | M | Cm | Stem | Kg | Planting | Coppicing |
| Ye Wuch Gedegeda Mager (የዉጭ ግድግዳ ማገር) | Construction wall from outside | 6.5 | 5.73 | 1 | | 3 - 4 | 2 |
| Ye Wuste Gedgeda Mager (የዉስጥ ግድግዳ ማገር) | Construction wall from inside | 5.6 | 4.22 | 1 | | 3 | 2 – 3 |
| Qesete (ቅስጥ) | Top of the wall and the roof | 8.1 | 6.37 | 1 | | 4 - 8 | 3 – 5 |
| Weraje (ወራጅ) | The roof and the wall | 8.65 | 8.28 | 1 | | 4 - 8 | 3 – 6 |
| Gureshume (ጉርሹም) | Inside and outside corner of the house | 8.25 | 9.55 | 1 | | 5 - 7 | 4 |
| Ye Qoreqoro Magere (የቆርቆሮ ማገር) | The roof with the Weraje | 6.85 | 7.16 | 1 | | 3-6 | 3 – 5 |
| Teshegagari (ተሸጋጋሪ) | A long pole, two said of the roof | 9.9 | 12 | 1 | | >7 | >6 |
| Felete (ፍልጥ) | Used for wall making | 2.45 | 6.73 | 1 | | >6 | >4 |
| Aerecho/Chefeka (ጨፈቃ) | Traditional/cottage construction | 4.2 | 1.98 | 1 | | 2 - 3 | 1 – 2 |
| Bark and Branch in bundles (ቅርፊት) | Broken branches and bark for fuelwood | - | - | | 50-60 | - | - |

**Splitted poles**: It is a *Eucalyptus* product that has a diameter of 6.73 cm and length of 2.45 m on average (Table 8). It is called Felete (ፍልጥ) in Amharic and mainly used for making a wall of a construction (local), fencing and fuelwood. Although it is the second important and ranked product, harvesting of *Eucalyptus* stand and using or selling as splitted pole is not a common practice of Chefasine tree growers. Tree growers harvest and split *Eucalyptus* when there will be a need for splitted pole for home consumption (construction). According to the discussion with the key informant interviews, splitted poles covers approximately 4% of the total wood sold to Hawassa and Tulla Towns. It is sold directly to constructors or carpenters and service providers (firewood, heating and cooking).

**Fuelwood**: It is the third-ranked *Eucalyptus* product in Chefasine following pole and splitted wood (Table 7). Chefasine tree growers were rarely harvested and sold *Eucalyptus* stand as fuelwood. It covers only 5% of the total wood sold to the traders (middlemen and wholesalers and retailers of fuelwood). It is mostly sold to Tulla town, as it is near to the Chefasine kebele. Tulla and Hawassa pole wholesalers and retailers sold their poles for fuelwood to the service providers and retailers at the same or reduced price. It happened when the pole was not sold, and the quality started to deteriorate. It was observed that Chefasine village traders have bought fuelwood from other villages (Moricho village, Shebedino District) and sold it to the Chefasine residents including tree growers. The reason was that in Moricho there are a lot of middlemen who are involved in fuelwood marketing and has better financial bases that allowed them to buy the stand of *Eucalyptus* and sold as fuelwood.

"*No one is interested in selling Eucalyptus stand as fuelwood for me because I do not have enough finance/money to buy the whole plot of land. The growers need someone who is capable of buying the whole stand. Thus, I usually buy the fuelwood from another middleman who is from Moricho kebele. Tree growers do not want to cut the tree for fuelwood purpose even for themselves. They are using the branches and leaves left from the sale of the stand and other species like Avocado. If they need more, they came here and bought from me*". Response from Chefasine fuelwood retailer.

**Seeds**: Seeds are reproductive materials collected from the matured *Eucalyptus* tree. In Chefasine kebele, tree growers collected seeds from their stand or their neighbour's *Eucalyptus* stands and used as a source of a seedling. Most of the tree growers have raised their own seedling on their farm. They prepared temporary beds and saw seeds in broadcasting. According to Million (2011), growing seedling does not require special knowledge and farmers in Ethiopia grow seedlings on their own.

**Branches and twigs**: These are products obtained from the *Eucalyptus* tree after harvesting, debranching and trimming. Branches and twigs are typically used for fencing and firewood. These products are retained parts of the harvested pole, after the pole has been debranching. Buyers have left the branches on the woodlot to the tree growers without any cost. But, sometimes, tree growers keep the wood products as a compensation until the trader's transported it to the market place/ storage area.

## 4.4 *Eucalyptus* products and their flow

Figure 12 shows different products of *Eucalyptus* and their flowchart from Chefasine tree growers to the end consumer. The products are poles (green line), splitted poles (yellow line), fuelwood (blue line), seeds (brown line), as well as branches and twigs including leaves (red line). Once the *Eucalyptus* stand is sold to the buyers, it starts to be processed (harvesting, debranching and piling, splitting or chopping) it into different parts such as poles, splitted poles, fuelwoods, branches and twigs depending on the intended use. *Eucalyptus* poles were delivered in the form of poles to Hawassa and Tulla towns. At Hawassa and Tulla the poles were sold as a pole or fuelwood after cutting into 1 m pieces. Splitted poles processed into fuelwood at Tulla and Hawassa by the service providers and traders. The consumers were from Chefasine (local), Tulla and Hawassa towns, Tulla Zuria and other neighboured kebeles of Tulla and Hawassa. Fuelwood was mostly delivered to Tulla town and rarely to Hawassa to the consumers such as to the service providers (hotels).

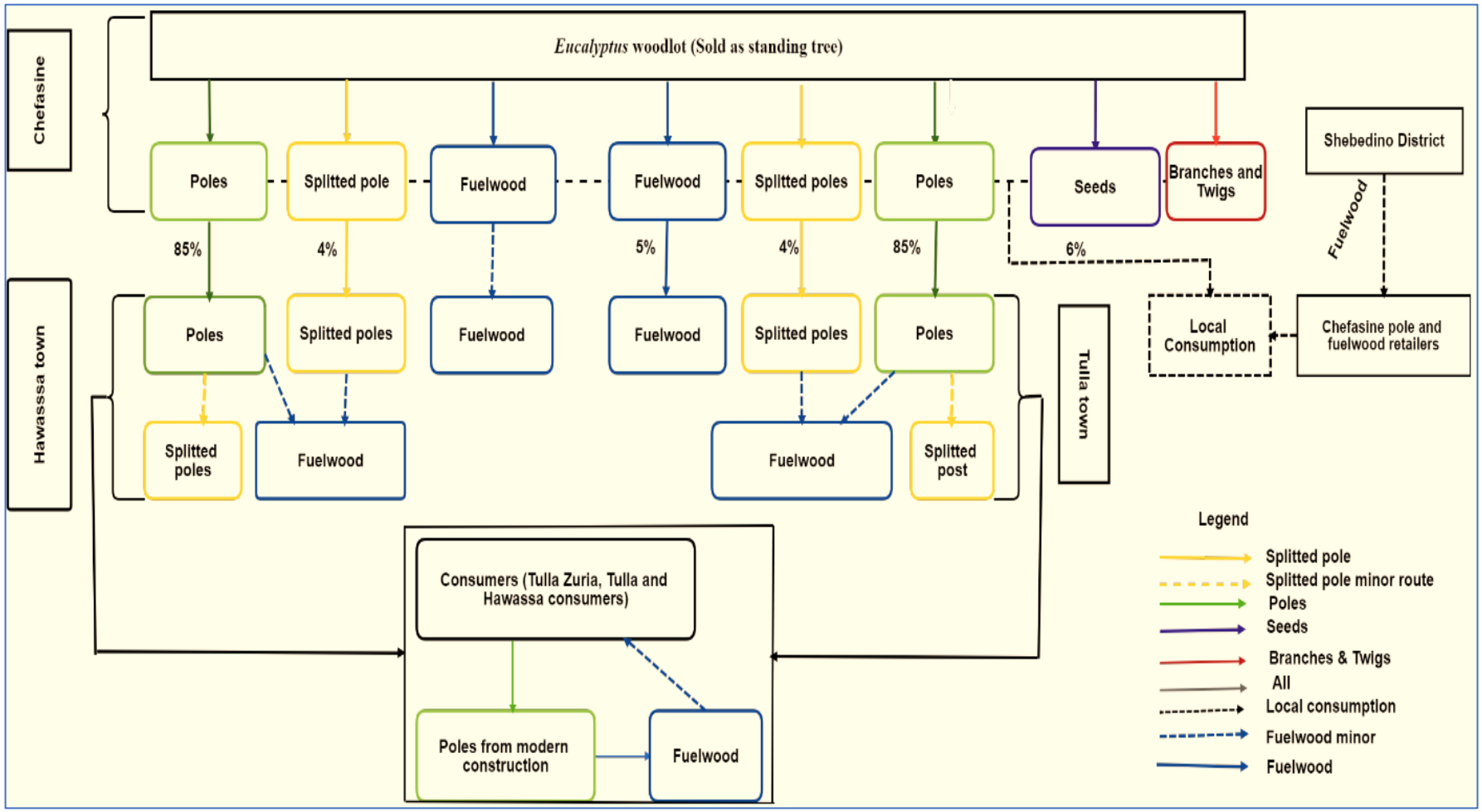


FIGURE 12. *EUCALYPTUS* PRODUCTS FLOW MAP FROM CHEFASINE TREE GROWER TO CONSUMER

## 4.5 Activities in the value chain of *Eucalyptus* products

*Eucalyptus* pole and fuelwood value chain in the Chefasine kebele has mainly four functional activities and segments namely production, processing, marketing or distribution that includes traders in the local and urban area such as local retailers, middlemen and wholesalers and retailer and consumers. Production of *Eucalyptus* pole and fuelwood was focused on the growth of *Eucalyptus* trees and is done by tree growers. The activities done by tree growers are land preparation, planting, weeding and hoeing, thinning and fencing. Processing is the second functional activity in the value chain of *Eucalyptus* products. It includes harvesting, debranching, splitting into small pieces of wood (Chopping), loading and unloading and storing. This activity is done by labourers who are living in Chefasine kebele. The third major function or activity is marketing or distribution. *Eucalyptus* products produced in the study area is marketed at rural (6%), and urban (94%) areas and different actors are involved. The product enters the local market where it is collected by Chefasine village retailers and urban areas where wholesalers and retailers and middlemen collect it. The middlemen and wholesalers and retailers transported the product to the urban market (Tulla and Hawassa town). At the local markets, local retailers buy a standing tree and sell it to the local consumers. Local retailers were used their garden to sell the products. Pole and fuelwood wholesalers and retailers of Tulla used their garden and areas nearby roadsides for vending their products. However, pole wholesalers and retailers of Hawassa have handled the marketing area provided by the government. The wholesalers and retailers assort poles in different sizes and store, sell or distribute them to the consumers. Consumption is the final functional activity carried out by local and urban consumers including constructors (traditional and modern) as well as service providers (hotels and restaurants).

## 4.6 *Eucalyptus* product value chain map and its linkages in the value chain

A value chain map is a map that allows one to depict all the activities, actors, their relationships and interactions within and among the chain. The value chain map of *Eucalyptus* poles and fuelwood that show a schematic presentation of actors, their process, function, the flow of the market, money as well as information is shown below (fig. 13 and 14). The value chain pattern of *Eucalyptus* poles originating from Chefasine kebele is intricate and involves a wide range of actors with their specific function and process at each node of the chain. As stated above, production, processing, marketing and consumption are the four functional activities of *Eucalyptus* value chain in the study area. These functions are undertaken in sequential order by tree growers, middlemen and wholesalers and retailers of Tulla and wholesalers and retailers of Tulla and Hawassa and consumers.

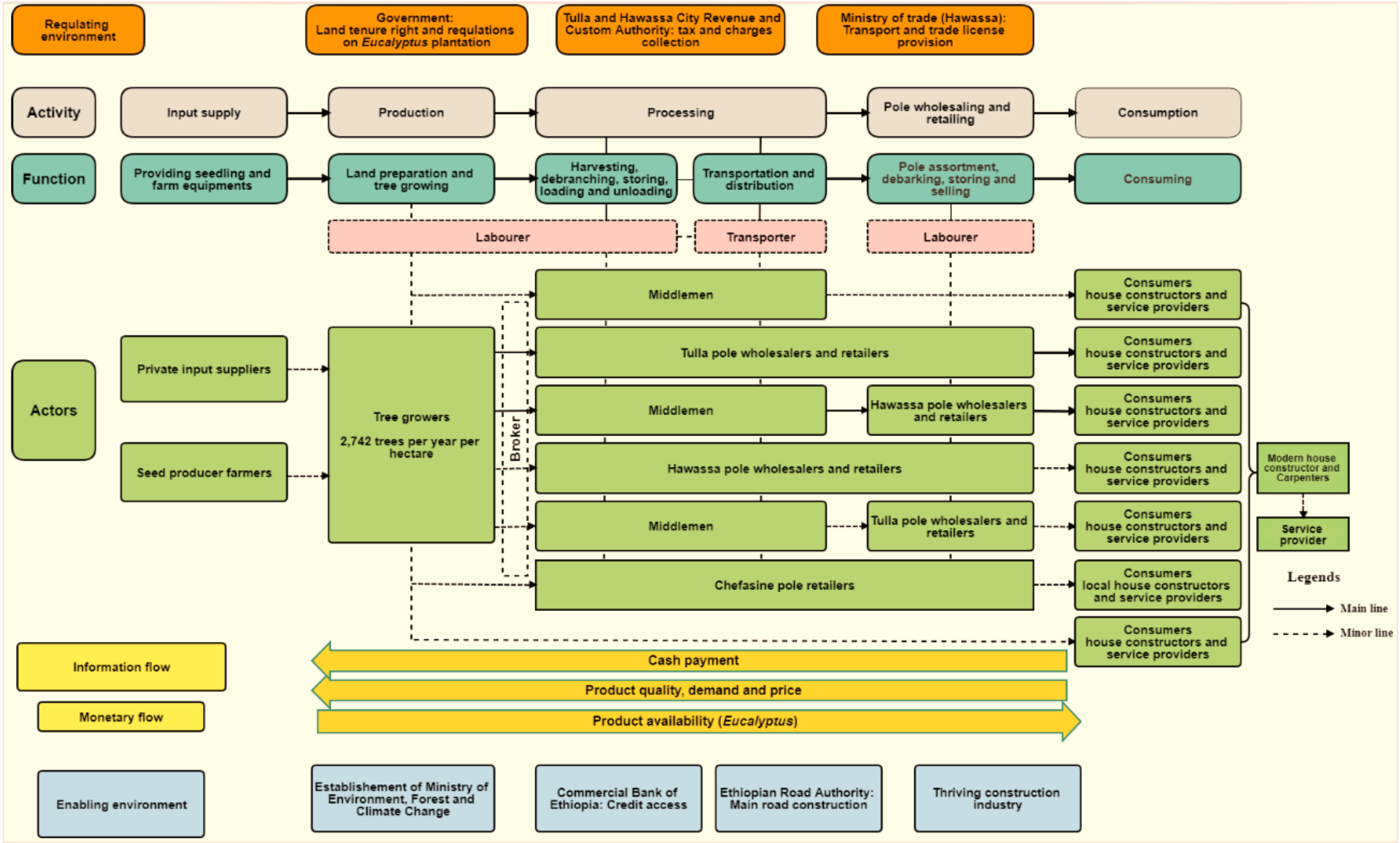


FIGURE 13. *EUCALYPTUS* POLE VALUE CHAIN MAP ORIGINATED FROM CHEFASINE KEBELE.

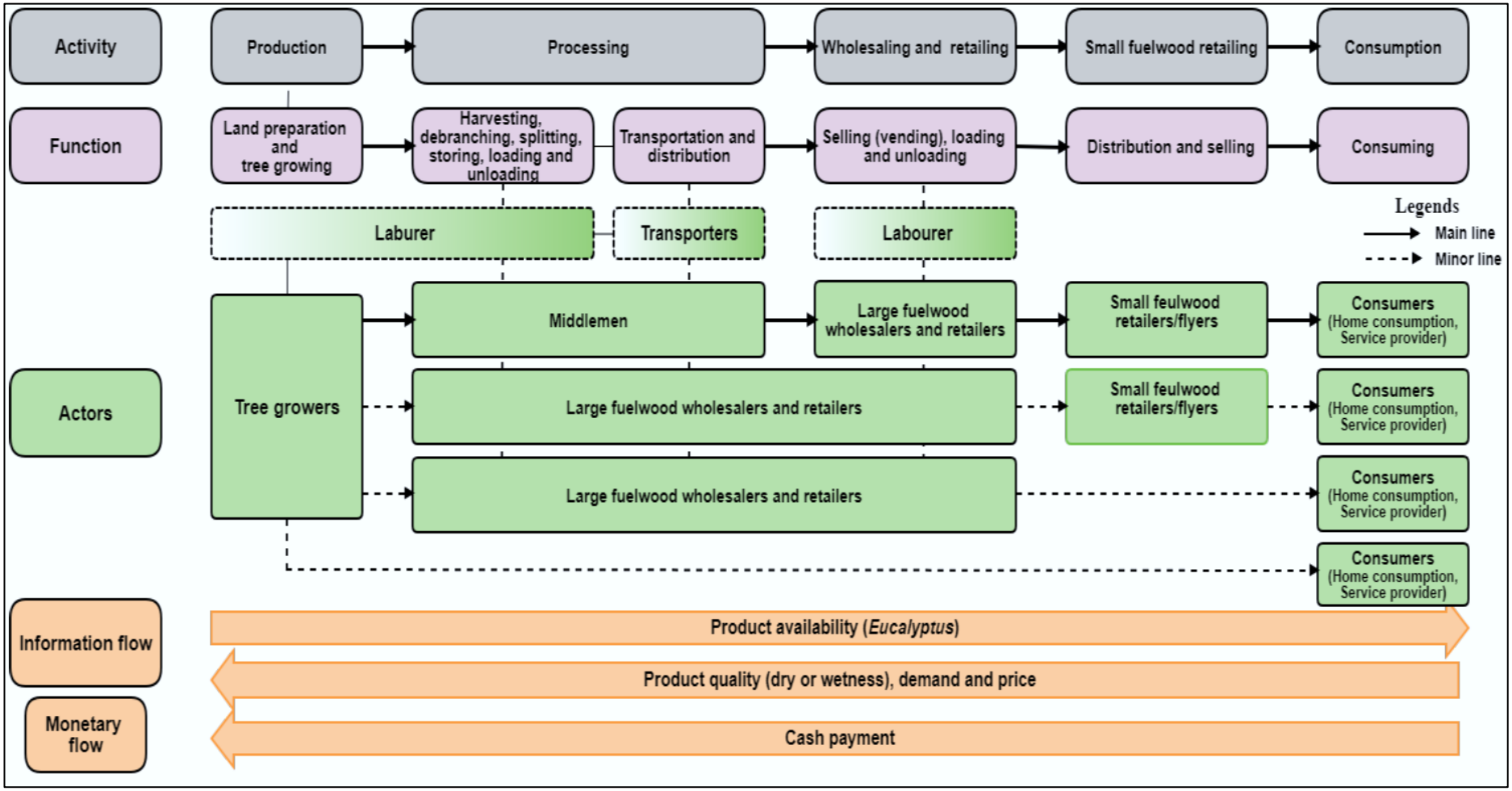


FIGURE 14. *EUCALYPTUS* FUELWOOD VALUE CHAIN MAP ORIGINATED FROM CHEFASINE KEBELE.

The study found 150 tree growers (having approximately 50 ha of woodlots), three Chefasine pole and fuelwood retailers (1 pole and two fuelwood), 7 Tulla pole wholesalers and retailers, four large fuelwood wholesalers and retailers and three small fuelwood retailers. Besides, three middlemen (two of them are from Morichio kebele, Shebedino District), 45 and above Hawassa pole wholesalers and retailers, two brokers, three transporters, one constructor and carpenters, workers and input and service providers (government institutions) were recorded (Table 9).

Table 9. Actors involved in *Eucalyptus* production and marketing originating from Chefasine kebele.

| Actor group | Number | Remark |
|---|---|---|
| Tree growers | 150 | |
| Chefasine pole and fuelwood retailers | 3 | Two poles and three fuelwoods |
| Tulla pole wholesalers and retailers | 7 | |
| Large fuelwood wholesalers and retailers | 4 | |
| Small fuelwood retailers | 3 | |
| Middlemen | 3 | 2 for pole and 1 for fuelwood (for pole from Tulla and Morchio, fuelwood from Chefasine) |
| Broker | 2 | |
| Transporter | 3 | |
| Constructor and carpenter | 1 | |
| Worker | Several | |
| Hawassa pole wholesalers and retailers | ≥45 | |

Diverse marketing lines characterised the chain. Marketing line is the sequence through which the whole product passes from producers to consumers (Mendoza 1995) and is intended to provide a systematic flow of goods and services from their origin to the final destination. In this study, a total of seven different marketing lines for *Eucalyptus* pole and four marketing lines for *Eucalyptus* fuelwood were identified (fig 13 and 14). The marketing line for *Eucalyptus* poles are:

- Line 1: Tree grower to Tulla pole wholesaler and retailer to consumer.
- Line 2: Tree grower to middlemen to Hawassa pole wholesaler and retailer to consumer.
- Line 3: Tree grower to middlemen to Tulla pole wholesalers and retailer to consumer.
- Line 4: Tree grower to Hawassa pole wholesaler and retailer to consumer.
- Line 5: Tree grower to middlemen to consumer.
- Line 6: Tree grower to Chefasine pole retailers to consumer (local house constractor).
- Line 7: Tree grower to consumer.

*Eucalyptus* poles and fuelwood produced by the tree growers were sold to consumers (constructors; modern and local, carpenters and service providers), village level retailers, and district or regional level traders. The two lines (line 1: tree grower to Tulla pole wholesaler and retailer to consumer and line 2: tree grower to middlemen to Hawassa pole wholesaler and retailer to consumer) are the major lines that the tree growers

of Chefasine used to sell their *Eucalyptus* stand. Tulla pole wholesalers and retailers and middlemen have processed the stand of *Eucalyptus* after buying from the tree growers and delivered to the consumers and Hawassa pole wholesalers and retailers, respectively. The other lines are not common and happened occasionally. For example, line 4 (tree grower to Hawassa pole wholesaler and retailer to consumer) occurred for those pole wholesalers and retailers of Hawassa who have relatives or families at Chefasine. Hawassa pole wholesalers and retailers are highly dependent on middlemen. In line 3, middlemen delivered the product to Tulla pole wholesalers and retailers occasionally, when the wholesalers and retailers are not able to go and buy it or when the demand is high in the town. Line 7 (tree grower to consumer: constructors; modern and local, carpenters and service providers) was the shortest line in which tree growers and consumers met together. The *Eucalyptus* fuelwood value chain market line includes the following:

- Line 1: Tree grower to consumer.
- Line 2: Tree grower to large fuelwood wholesaler and retailer to consumer.
- Line 3: Tree grower to large fuelwood wholesaler and retailer to small fuelwood retailer to consumer.
- Line 4: Tree grower to middlemen to large fuelwood wholesaler and retailer to small fuelwood retailer to consumer

Among the four lines, line 4 (tree grower to middlemen to large fuelwood wholesaler and retailer to small fuelwood retailer to consumer: home consumption and service provider) was the most common and essential that connects tree growers, middlemen, large fuelwood wholesalers and retailers, small fuelwood retailers and consumers. The other lines are occasional and occurred rarely in the value chain.

Value chain map is a useful tool that indicated how value chain actors relate to one another. The black arrow in the map (fig. 13 and 14) indicates the structured nature of the supply of *Eucalyptus* poles and fuelwood and implies strong and persistent links in the overall chain. For pole 1) tree growers to Tulla pole wholesalers and retailers and 2) tree growers, middlemen and Hawassa pole wholesalers and retailers are the leading and persistent lines. While for fuelwood tree growers, middlemen, large fuelwood wholesalers and retailers and small fuelwood retailers (flyers) are the common lines. According to the key informant interview, 85% and more of the pole and 5% and more of fuelwood passed through this line and reached to the final consumers.

On the other hand, the dotted arrow indicated in the value chain map represents an irregular supply of raw material, flow of *Eucalyptus* products (poles and fuelwood) and suggests a weak link and relationship in between and among the actors. These lines are best stated as an occasional/seasonal chain. Information for the availability of the resources (*Eucalyptus* stand ready for sale) flows from the tree grower to the consumer, whereas, monetary values including demand and price of the products and method of payment have emanated from the consumer to the tree growers. Payment in all cases are carried out through cash; there is no any advanced payment.

## 4.7 Value chain actors, characteristics and their function

*Eucalyptus* products (pole and fuelwood) value chain originating from Chefasine kebele has connected and engaged various direct and indirect actors. Regarding to the position, place and function of actors in the value chain of *Eucalyptus* pole and fuelwood, a total of 12 groups of actor, 9 direct (major) groups of actors including *Eucalyptus* tree growers, middlemen, transporters, workers, Tulla pole wholesalers and retailers, Hawassa pole wholesalers and retailers, large fuelwood wholesalers and retailers, small fuelwood retailers (flyers), consumers (constructors, carpenters and service providers) and 3 minor actors government, input providers and brokers were identified. Details on each agent (actors) and their respective functions in the value chain are provided and characterised hereafter.

**Tree growers:** Tree growers are those households or farmers who are involving in *Eucalyptus* production activities. Tree growers have motivated by several reasons to plant and manage *Eucalyptus* trees. The price rise of the products (especially *Eucalyptus* poles), its fast growth, easy and less cost of management, the low requirement of input as well as the decline of land quality for khat and coffee production are some of them. In the village there are no restrictions that prohibit farmers from planting *Eucalyptus* tree; thus, the decision on whether to plant or not to pant *Eucalyptus* depends on demands of *Eucalyptus* products in the market and own consumption.

The function of *Eucalyptus* tree growers at Chefasine kebele is limited to land preparation, planting and tending of *Eucalyptus* stand. As compared to other crops or farming systems *Eucalyptus* plantation is less labour intensive by its nature. Most of the demanding labour work confined to the establishment and harvesting works. However, in Chefasine, harvesting is not the work of the tree growers, as they sell the standing tee. Besides, pruning, thinning and using proper spacing is not a common practice for Chefasine tree growers (fig. 15). Tree growers fence their stand to protect the newly established or coppicing shoot from damage by any domestic animals.

FIGURE 15. *EUCALYPTUS* COPPICE STAND (LEFT) AND NEWLY ESTABLISHED STAND (RIGHT).

**Transporters:** Transportation involves the transfer of *Eucalyptus* poles and fuelwood from plantation area (tree grower) to the consumer and market (sell) area. It has performed with trucks containing 500 to 600 poles and donkey cart load carrying 800 pieces of fuelwood. Trucks and donkey-pulled carts are the two most transportation systems used by different actors. The distance of transportation, the road condition and amount (pole and fuelwood) were the main factors for the determination of this transportation means. For instance, transportation from the tree growers to the Chefasine retailers and all fuelwood transportations from Chefasine to Tulla and Hawassa have done by using donkey cartload, while transportation of pole from Chefasine to Tulla and Hawassa towns by the Tulla pole wholesalers and retailers and middlemen have done by using trucks. Transporters are independent entrepreneurs transporting 500 to 600 *Eucalyptus* poles on average US $ 18.35 to 25.68 (500 to 700 ETB) to Tulla and US $ 29.36 to 51.37 (800 to 1,400 ETB) to Hawassa town. They transport 800 pieces of fuelwood (one load) US $ 1.47 to 1.83 (40 to 50 ETB) to Tulla and US $ 1.83 to 2.57 (50 to 70 ETB) to Hawassa. Although this is the average cost, the cost of a truck of pole and donkey cartloads of fuelwood is dependent on many other factors such as season, distance from the stand to the main road, location of the stand and accessibility of the road. Few, and occasionally, Hawassa pole wholesalers and retailers transported their product themselves and rendered transport service to the other traders (transporter). However, according to the key informant interview, transporting *Eucalyptus* pole is not the main job of the transporter, the customer (buyer) called to them when they need and planned before a month.

**Middlemen:** Middlemen are important actors of *Eucalyptus* pole and fuelwood business in Chefasine, and their main function is buying *Eucalyptus* stand from tree grower and delivering the harvested, debranched and split wood mainly to Hawassa pole wholesalers and retailers and rarely to Tulla pole wholesalers and retailers and consumers. Middlemen offered the processed and finished fuelwood mostly to Tulla fuelwood wholesalers and retailers and rarely to consumers (service providers). They connect tree growers with wholesalers and retailers and consumers. These actors are small in number (three), and two of them are from Moricho kebele, Shebedino District. Most of the time they used a rented vehicle including the driver for the transportation of pole and donkey cart for the transport of fuelwood and utilised labourers for harvesting, debranching, splitting, piling, loading and unloading wood in to and out of the truck and donkey carts. Knowledge of the identification of quality stand, guessing the stand value and marketing *Eucalyptus* are their futures and characteristics.

**Tulla pole wholesalers and retailers:** These are actors of *Eucalyptus* pole value chain from Chefasine to Tulla town. They are located in Tulla town. The primary function of this actors is storing and selling of *Eucalyptus* pole at Tulla town and to the neighbouring villages. In addition to selling and distributing *Eucalyptus* pole, they are involved in harvesting, debranching, loading and unloading and transporting functions of the chain. These characteristics made them similar to the actors of middlemen. They are better

off than middlemen regarding capital and market range. In a rare case, they buy processed and semi-processed *Eucalyptus* pole from middlemen. For this actor's *Eucalyptus* pole is the leading business, while few actors were processed the pole into fuelwood and used fuelwood as a secondary business. They also assort *Eucalyptus* pole in different pole types based on the size and quality of the pole. In addition to *Eucalyptus* trading, a few of these actors are involved in farming activities and trading of goods and commodities.

**Hawassa pole wholesalers and retailers:** These are actors lived in Hawassa and *Eucalyptus* pole trading is their main job. The main function of this actors is storing, selling and assorting of *Eucalyptus* pole that they received from the middlemen. The main difference between these actors from Tulla pole wholesalers and retailers is that they are highly dependent on middlemen for *Eucalyptus* pole as they are far from Chefasine kebele. Besides, lack of relations with tree growers makes them dependent on the middlemen. They were afraid of their product to be stolen if they go and buy the stand. However, they are better off than middlemen and Tulla pole wholesalers and retailers regarding capital and market spaces. Those who have families in the village in a rear time did the harvesting, loading and unloading and transporting functions of the chain. They all are educated and were jobless before they start this business.

**Large fuelwood wholesalers and retailers:** These actors are common fuelwood agents whose primary function is distributing and vending fuelwood to small fuelwood retailers and consumers. Fuelwood is their primary business. They used the road said of their home for selling of fuelwood and as they stated storage space is the main problem of their business.

**Small retailers of fuelwood (Flyers):** These are another familiar actor of fuelwood value chain and the main function of these actors are transporting, distributing and selling of fuelwood to the urban consumers by moving around the town. These actors are from the city and have their own donkey cart. They do not have their own fixed space for vending and have low capital than the large fuelwood wholesalers and retailers. They distributed 2 to 4 donkey cartloads of fuelwood per day.

**Labourers:** Labourers are a critical component in most of the stages of the value chain of *Eucalyptus* pole and fuelwood production and marketing. Most of the works of *Eucalyptus* production and processing are done manually. The function of the labourer in the *Eucalyptus* pole and fuelwood production and marketing includes planting, weeding and hoeing, harvesting of *Eucalyptus*, removal and separation of branches and twigs. Besides, transporting to the roadsides or stacking in one area, loading and unloading, chopping large size woods into a smaller sized wood and fuelwood (1 meter) and assorting different heterogenous class of poles based on the size, length, quality and function of the pole among others. The labourers were found working without any safety measures (fig. 16). They were not equipped with any protective equipment.

FIGURE 16. WORKERS AT HAWASSA POLE WHOLESALER AND RETAILERS MARKET, ARRANGING AND LOADING OF WOOD

The workers in the production area are from Chefasine village. Most of them were students but not continuing with their education and depending on their families. The workers in Tulla and Hawassa towns for loading and unloading, sorting and splitting are from the city of Tulla and Hawassa. They are young workers and do not have other jobs at all. The work has done in a group of 5 to 10 labourers. The workers asserted that they were not satisfied with the wage that they are getting. It is because of the increment of populations in the village and the labourer used for felling, debranching, piling, loading and other activities are from tree growers and their neighbours. Sometimes only family labourers and their relatives have participated in the work. Moreover, according to their statement, the work is seasonal, for example, from June to the end of September none of the tree growers are involved in selling *Eucalyptus*. The participation of female worker was found to be almost non-existent. Only a few female labourers have participated in weeding and hoeing of *Eucalyptus* stands. The reason is *Eucalyptus* production and marketing are mainly set aside for man in the village.

**Brokers:** These actors are farmers lived in Chefasine kebele. They intervened in the sale of *Eucalyptus* woodlots by bringing together tree growers, traders (middlemen, wholesaler and retailer) and consumers. Their main aim was bringing together and negotiating tree growers and buyers for the marketing of *Eucalyptus* stand. In a rare case, they bought the stand of *Eucalyptus* and sold it to the buyers. However, because of their financial limitation, buying the stands of *Eucalyptus* were not a typical job for them. They were characterised by their mobility, from place to place, to search for information about *Eucalyptus* plantations. They were also in contact with many traders of *Eucalyptus* (middlemen and wholesalers). The payment for the broker is through negotiation and depend on the way that they interven. They captured on average, from 100 to 250 ETB (US $ 3.67 to 9.17) per hectare if they negotiate tree growers and traders and 500 to 1500 ETB (US $ 18.35 to 55.05) if they buy and sold the *Eucalyptus* stand to the buyers. Broking is

not their everyday business; they have done it as a secondary business. Agriculture is the primary activity of these actors.

**Consumers:** According to the focus group discussion consumers of *Eucalyptus* pole and fuelwood includes local (village) consumers and urban consumers (constructors, carpenters and service providers). Local consumers are those consumers directly buying the *Eucalyptus* stand from tree growers or Chefasine pole and fuelwood retailers. The domestic consumers also include those tree growers who have involved in tree production and management. It is because tree growers want to sell the *Eucalyptus* stand at once and they do not want to harvest from their stand. The survey observation confirmed that fuelwood, which the Chefasine retailers purchased from Shebedino District (Moricho village) sold at Chefasine kebele for both who have *Eucalyptus* as well as do not have *Eucalyptus*. The other big *Eucalyptus* pole and fuelwood consumers are urban consumers including constructors (modern and traditional house constructors), carpenters and service providers. Modern house constructors used *Eucalyptus* pole mainly for house construction and scaffolding purposes. Service providers are those consumers used mostly fuelwood for cooking, firing and heating purpose. Generally, the consumption methods were varied and included construction, fence, agricultural equipment's, scaffolding and cooking, heating and firing. Moreover, *Eucalyptus* poles recycled in the form of firewood, after repairing and replacement jobs from modern constructions (scaffolding).

**Enabling institutions**: Ministry of Environment, Forest and Climate Change (HMEFCC), Commercial Bank of Ethiopian (CBE), Hawassa city administration and Ethiopian Road Authority (ERA) are the major enabling bodies for the current commercialisation of *Eucalyptus* poles and fuelwood from Chefasine. The Hawassa Ministry of Environment, Forest and Climate Change (HMEFCC), the newly established ministry, have an objective of motivating farmers to plant trees and increase their income and reduce poverty, conserve the environment and increase the percentage of forestry and its contribution to the national income. The mandates of the ministry are preparing a guideline for tree planting and managing, coordinating and supporting of forestry activities (technical support like training on how to raise seedling, where and when to plant trees, financial support) and undertaking research to support forest development. Credit institutions like CBE provide financial loans to traders (Hawassa and Tulla pole wholesalers and retailers) for their startup work. Hawassa city administration provides marketing area for the trader of *Eucalyptus* poles and fuelwoods. In addition, infrastructural development centers including roads were provided by the Ethiopian Road Authority.

**Regulating institutions:** Government, Hawassa City Revenue and Customs Authority (HCRCA) and Ministry of Trade (MT) at Tulla and Hawassa are the major regulating bodies for the commercialisation of *Eucalyptus* pole and fuelwood. The government offers for tree growers land user rights (security of tenure) and rules and regulations for *Eucalyptus* planting. Collecting tax and charges from the traders and tree

growers are the main function of Hawassa City Revenue and Customs Authority. Tax is collected from tree growers in the form of land tax and not determined by *Eucalyptus* woodlot or land size. Ministry of trade at Hawassa and Tulla provides transport and trade licenses to *Eucalyptus* poles and fuelwood traders (middlemen, pole and fuelwood wholesalers and retailers). The enabling and supporting environments are more elaborated under section 2.8 (regulating and supporting environment).

**Input providers:** These are actors who are providing inputs such as seedling and farming equipment for tree growers. These input providers may or may not be tree growers and from Chefasine village. The knowledge of tree growers for *Eucalyptus* trees seedling production, planting, spacing, rotation length, harvesting, marketing, pest identification and control is traditional and from their experiences. According to Bekele (2011), tree growers in Ethiopia have good traditional knowledge and long experience without access to extension services to collect seeds, grow seedlings, and plant and tend the crop. However, this knowledge and experiences do not entail the technical and important knowledge for plantation establishment and management. Smallholder tree growers in Tanzania, received tree planting and management knowledge from support organizations (Hingi 2018). Hingi further urged that woodlots performance was better for supported than unsupported ones. That means for improved woodlots development, support of tree growers in the study area, in terms of training to enrich knowledge about tree planting, spacing, rotation length, harvesting and how to act in case of pest occurrence is crucial.

## 4.8 *Eucalyptus* pole and fuelwood value added and its distribution along the chain

### 4.8.1 Quantifying flows of *Eucalyptus* pole value chain

In Sidama zone generally and Chefasine particularly, *Eucalyptus* stand is sold as a standing tree from the tree growers to any potential buyers through bargaining and negotiation (fig. 17). During the bargaining and negotiation, tree growers used their experience to estimate the price of their *Eucalyptus* stand. It is because, knowledge for stand value calculation among tree growers is lacking. In addition, no specialized forestry extension officers to train tree growers in the study village. While buyers (middlemen and Tulla pole wholesalers and retailers) used their experiences as well as market information for negotiation. After a lengthy discussion and talk, they reached a point of consensus about the price of the *Eucalyptus* stand. In addition to the experiences and market information of buyers, the price given to the stand is affected by many factors including distance from the main road, the quality of the stand, the size and age of the stand. Middlemen and wholesalers and retailers estimate the stand value and set price which favors their profit on the basis of market information (e.g. demand and supply) which the tree growers do not have. A retailer and wholesaler in Tulla town, namely Murka, even possess a unique skill to estimate to a high degree of accuracy, the number of trees of different pole types in a stand. Economic status and income need of tree

growers influenced their decision. If they need money for a specific purpose, they do not argue a lot with the buyers. One of the interviewed tree growers noticed that, he sold his good stand lower than the price he sold before three years to cover the treatment cost of his son as well the cost for education fees and house rent.

On average, it was estimated that a total of 16,129 poles could exist in one hectare. According to the note from the middlemen, from a Kada[3], seven trucks of poles were obtained. They usually load a truck 500 to 600 numbers of poles. From section 2.4 (fig. 12) it was observed that about 85% of the poles has delivered to Hawassa and Tulla towns. It means 13,710 trees per ha per 5 years of rotation or 2,742 trees per ha per year as poles from a tree grower was supplied to Tulla or Hawassa towns. However, it was not possible to estimate the quantity of the pole provided to Tulla and Hawassa towns, separately. This is due to four possible reasons. First, the trader has bought *Eucalyptus* poles from different villages and did not have a record, how much is from Chefasine. Secondly, most of the tree growers did not know precisely whether the *Eucalyptus* poles delivered to Hawassa or Tulla. Thirdly, there are off and on middlemen and wholesalers and retailers and finally, pole wholesalers and retailers of Hawassa do not know the specific area that they received the products. Thus, an equal number of poles (2,742) per hectare per year were assumed to be supplied for both at Tulla and Hawassa towns.

### 4.8.2 Quantifying the *Eucalyptus* fuelwood value chain

For the quantification and estimation of fuelwood, a tree stand sold during the date of data collection were considered. The calculation is just an estimate based on the information obtained from tree growers and middlemen since most farmers sell standing trees and the final price is determined by their ability to bargain with the potential buyer. In this case, a farm-gate price which is about US $ 11 (300 ETB) for a tree, paid by the middlemen to a tree grower was used for the estimation of revenue, cost, margin and value added. The middlemen bought a *Eucalyptus* tree with the age of more than seven years (approximated to 0.11 $m^3$) to obtain a high amount of donkey cartloads of fuelwood. The middlemen have to negotiate the final price with the tree growers, and this varies significantly regarding the season, age of the tree, size of the tree and even the area that the tree grows. After harvesting, the tree is de-branched and split into pieces of 1-meter log fuelwood. The split fuelwood transported to the larger fuelwood wholesalers and retailers in the urban centers. Donkey cartloads were having 800 pieces of wood on average (fig. 17).

[3] Kada (Bulek in Amharic) is the local unit of land in Sidamagna, which is equal to a quarter of a hectare.

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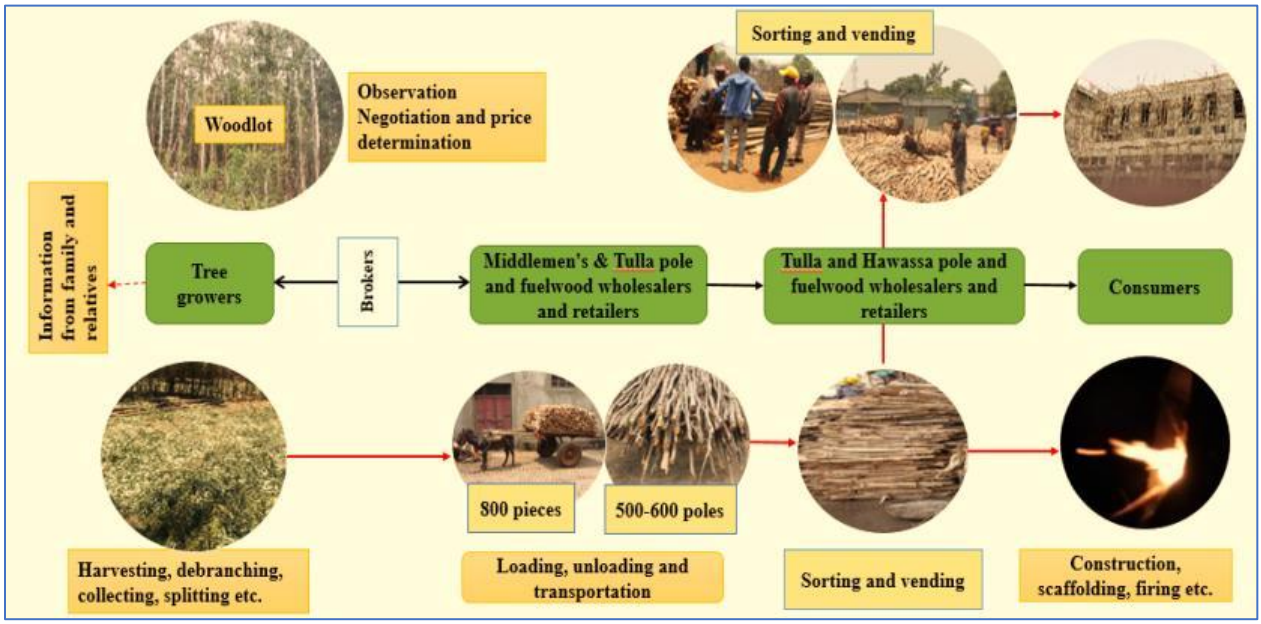



FIGURE 17. PROCESSING OF *EUCALYPTUS* FROM TREE GROWER TILL CONSUMERS.

### 4.8.3 Economic calculation of *Eucalyptus* poles and fuelwood

The third step following mapping and quantification was the economic analysis of the value chains. In this stage, the flow of revenues accumulating at various stages of the value chain was analysed based on the following aspects: 1) income, margin and quantities of pole and fuelwood handled by the different actors, 2) distribution of costs and margin among and within the actors. Thus, the value chain of *Eucalyptus* pole and fuelwood has analysed regarding revenue, cost and margins created at different stages/segments of the chain. The calculation was done based on the purchase, sale and expenses data collected during field visits. The product price denotes the sale price of unit products. The cost consists of money spent on the product purchase, labour cost, transpiration cost, tax and fees and other expenses. A margin is an actual money that an actor receives (revenue) minus total expenses. The cost of items involved was presented in a way to make it easy to differentiate between value adding and non-value adding costs. Formal taxes and fees and labour costs (wages) contributed to the value addition. Labour cost includes the cost of family and hired labourers. Other cost includes transaction costs (communication cost), cost of brokers and seedlings. Transportation cost is the cost paid for transporting the product and included the costs of the driver for the pole value chain. As it was seen from the map of *Eucalyptus* pole and fuelwood (fig. 13 and 14), the value chain process is not straightforward, due to the participation of many actors along the chain. The result shows two different main marketing lines for pole and one main marketing line for fuelwood (fig. 13 and 14). These main marketing lines were used for the economic analysis of *Eucalyptus* pole and fuelwood.

Main marketing line for *Eucalyptus* pole **(Line 1: tree grower to Tulla pole wholesaler and retailer to consumer and Line 2: tree grower to middlemen to Hawassa pole wholesaler and retailer)**.

Main marketing line for *Eucalyptus* fuelwood (**Tree grower to middlemen to large fuelwood wholesaler and retailer to small fuelwood wholesaler and retailer to consumer**).

#### 4.8.3.1 Price structure of *Eucalyptus* pole value chain at different levels

**Tree grower (producer) level:** The price structure at the *Eucalyptus* tree grower level for 2,742 number of poles per ha per year is presented in Table 10. The costs involved were the cost of labourers, seedling purchase and production, and transportation as well as tax for land. Labourer costs are the main component of all these costs. Using hired labour for *Eucalyptus* is uncommon in the study area. On average each tree grower receives US $ 1,308 (35,646 ETB) per hectare per year from the selling of 2,742 poles, which accounts a profit margin of 93%. The higher profit margin is due to the absence of the product cost. Also, it indicates the need for lower input requirement for *Eucalyptus* production. On average, tree growers spent 844 ETB to purchase seedling**.**

**Tulla pole wholesalers and retailers:** These are actors who purchased *Eucalyptus* stand from tree growers directly and for vending it at Tulla town, which is approximately 7 km further from the Chefasine Kebele. The price, cost and margin structure of *Eucalyptus* pole for Tulla *Eucalyptus* pole wholesalers and retailers is presented in Table 10. These actors were involved in *Eucalyptus* pole market through different value-added activities. They are transforming the *Eucalyptus* products into semi-processed pole from the standing tree and transported it to the town and distributed to consumers. The costs involved are product cost (*Eucalyptus* pole), harvesting cost, transporting costs, loading and unloading costs, costs of assorting poles in the landing and taxes and fees. From 2,742 poles, they received a margin of US $ 2,207 (60,133 ETB) per year which accounted for a profit margin of 59%. The total cost that they spend accounted for US $ 1,526 (41,321 ETB).

**Middlemen:** The price structure of the middlemen is presented in Table 10. In this chain level, similar cost structure was observed as Tulla pole wholesalers and retailers. The fundamental difference is the transportation cost from Chefasine to Hawassa town and the cost for the assortment of poles. The cost of transportation on average was US $ 40 (1,100 ETB) per truck containing 550 *Eucalyptus* poles. They received a total of US $ 624 (17,000 ETB) from a truck of poles on average. The total revenue from one hectare of *Eucalyptus* pole accounts 85,002 ETB which accounts a gross profit margin of 48%. A total cost of US $ 1,615 (43,996 ETB) was involved in receiving US $ 3,120 (85,002 ETB) as a revenue.

**Hawassa pole wholesalers and retailers:** Hawassa pole wholesalers and retailers buy semi processed poles from middlemen. They received one truck of *Eucalyptus* poles from middlemen at an average cost of US $

624 (17,000 ETB). Entirely they received US $ 4,830 per 2,742 poles per year from Chefasine kebele which accounts for a profit margin of 34%. The profit margin of this actor is lower than another actor. It is due to the involvement of higher product purchase cost. They paid a total fee of US $ 8,233 from this US $ 8,183 was used for the purchase of *Eucalyptus* pole. A summary table for revenue, costs involved, margin and profit margin of all actors of *Eucalyptus* poles were presented in Table 10 and the detailed in Appendix II.

Table 10. Summary of benefit and cost of pole value chain for different actors originated from Chefasine (US $ per ha).

| Actors | | Chefasine tree growers | Middlemen | Tulla pole wholesalers and retailers | Hawassa pole wholesalers and retailers |
|---|---|---|---|---|---|
| **Revenue** | Quantity | 2,742 | 2,742 | 2,742 | 2,742 |
| | Unit price | 0.48 | 1.14 | 1.36 | 1.76 |
| | Total | 1,308 | 3,120 | 3,723 | 4,830 |
| **Costs** | Product | 0.00 | 1,308 | 1,308 | 3,119 |
| | Family labour | 53.00 | 0.00 | 0.00 | 0.00 |
| | Hired labour | 0.00 | 73.41 | 73.39 | 23.85 |
| | Tax and fees | 2.39 | 12.84 | 11.01 | 21.1 |
| | Transport cost | 0.00 | 202.00 | 110.09 | 0.00 |
| | Other costs | 30.98 | 18.34 | 13.75 | 4.59 |
| | Total cost | 86 | 1,615 | 1,516 | 3,169 |
| **Margin** | | 1,222 | 1,506 | 2,207 | 1,661 |
| **Profit Margin (%)** | | 93 | 48 | 59 | 34 |

#### 4.8.3.2 Price structure of *Eucalyptus* fuelwood value chain at different levels.

A summary of the breakdown of the benefit, cost, and margin of actors for fuelwood value chain was given in Table 11, and the detailed analysis found in Appendix II. The main actors of the *Eucalyptus* fuelwood value chain are tree growers, middlemen, large fuelwood wholesalers and retailers and small fuelwood retailers (flyers). For this analysis, a tree (1.06 $m^3$) which costs, on the average US $ 11 (300 ETB) for the middlemen and revenue for the tree growers were used. The middlemen get five donkey cartloads from the US $ 11 priced trees. One donkey cartload contains on average 800 pieces of fuelwood. Each part of fuelwood was sold at US $ 0.03 (1 ETB). So, the middlemen earn revenue of US $ 11 from one donkey cartloads and US $ 147 from a stand. The large fuelwood wholesalers and retailers resell a piece of fuelwood at a price of US $ 0.04 (1.10 ETB) to the small fuelwood retailers and US $ 0.05 (1.25 ETB) for consumers who come to their vending site. The price difference is because small fuelwood retailers buy a higher quantity of fuelwood, at least a full of donkey cartloads. Then the small fuelwood retailers again resell the fuelwood directly to the consumer by moving around the town at a price of US $ 0.05 (1.25 ETB) per pieces.

Table 11. Summary of benefit, cost and margin distribution from five loads of fuelwood (1.06m$^3$) for different actors along the chain (US $).

| | Actors | Tree growers | Middlemen | Large fuelwood wholesalers and retailers | Small fuelwood retailers (Flyers) |
|---|---|---|---|---|---|
| **Revenue** | Quantity (Cartload) | 5.00 | 5.00 | 5.00 | 5.00 |
| | Unit price | 2.20 | 29.34 | 32.29 | 36.69 |
| | Total price | 11.00 | 146.79 | 161.47 | 183.49 |
| **Costs** | Product cost | 0.00 | 11.00 | 146.79 | 161.47 |
| | Family labour | 1.60 | 0.00 | 0.00 | 2.94 |
| | Haired labour | 0.00 | 18.71 | 1.83 | 0.00 |
| | Tax and fees | 0.00 | 0.00 | 0.92 | 0.00 |
| | Transportation cost | 0.40 | 11.01 | 0.00 | 3.67 |
| | Total cost | 2.00 | 40.72 | 149.54 | 168.08 |
| **Margin** | | 9.00 | 106.07 | 11.93 | 15.41 |
| Profit margin (%) | | 82 | 72 | 7 | 8 |

The above table shows that tree growers and middlemen were received US $ 11 (300 ETB) and 146.79 (4,000 ETB), respectively from 5 loads of fuelwood accounting for 82% and 72% of the profit margin, respectively. The cost involved for the tree growers are labour and seedling costs and for the middlemen are product cost (cost of 5 cartloads of fuelwood), labour cost (felling, splitting, loading and unloading and transporting) and communication cost (mobile calling). Large fuelwood wholesalers and retailers and small fuelwood retailers received an average of US $ 162 (4,400 ETB) and 184 (5,000 ETB) and a margin of US $ 12 (327 ETB) and 15 (400 ETB) per 5 loads, respectively. Large fuelwood wholesalers and retailers have a profit margin of 7% while small fuelwood retailers have 8% of a load of fuelwood. The costs involved for small fuelwood retailers are product cost (cost of loads of fuelwood), transportation cost and labour cost.

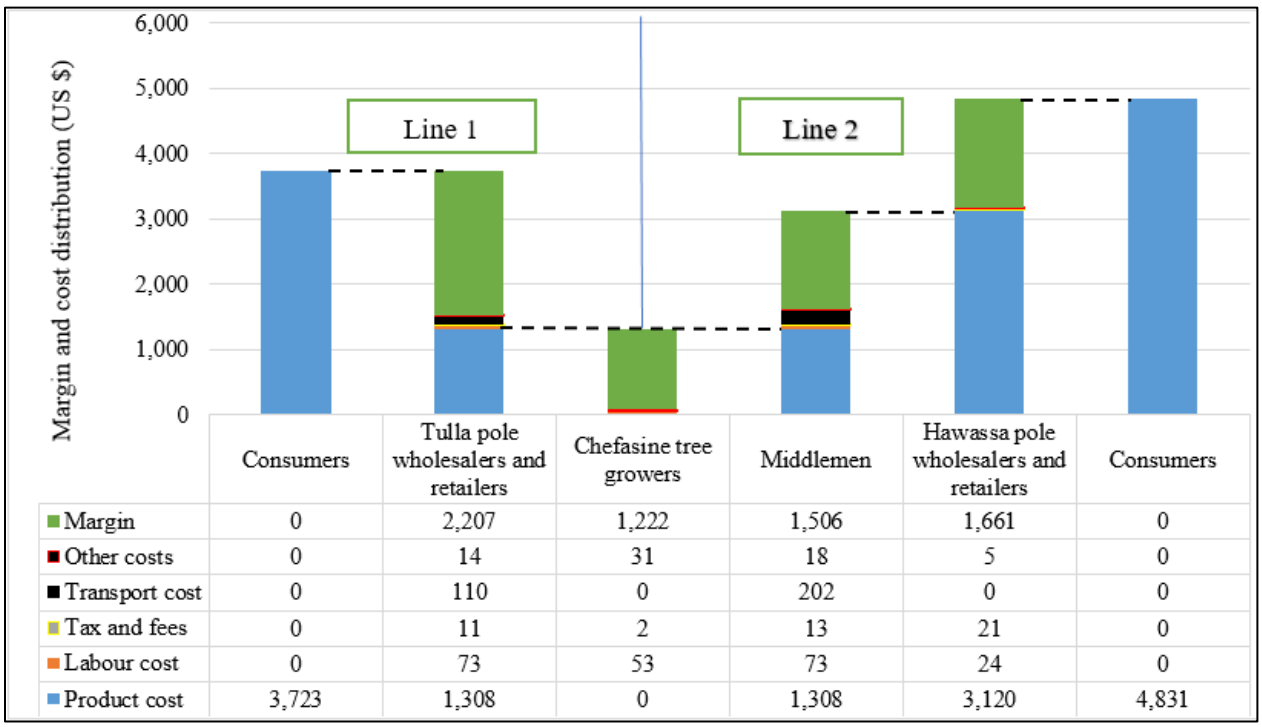
#### 4.8.3.3 Cost distribution of *Eucalyptus* poles and fuelwood

***Eucalyptus* poles cost distribution:** The basic structure of costs involved per 2,742 trees per hectare or 5 trucks of *Eucalyptus* pole for the identified lines and respective different actor's level was presented in Table 12. A total cost of US $ 1,602 (43,654 ETB) and US $ 4,869 (132,680 ETB) for pole at line 1 (from Chefasine to Tulla) and line 2 (from Chefasine to Hawassa), respectively was incurred as a whole from the tree growers up to the pole wholesalers and retailers of each lines of *Eucalyptus* pole.

Table 12. Distribution of costs at different actor levels for pole from Chefasine to Tulla (Line 1) and Chefasine to Hawassa (line 2) (US $).

| Line | Actors | Product cost | Labour cost | | Tax and fees | Transport cost | Other costs | Total cost |
|---|---|---|---|---|---|---|---|---|
| | | | Family | Hired | | | | |
| Line 1 | Chefasine tree growers | 0 | 53 | 0 | 2 | 0 | 31 | 86 (5.36%) |
| | Tulla pole wholesalers and retailers | 1,308 | 0 | 73 | 11 | 110 | 14 | 1,516 (94.63%) |
| | Accumulated value | 1,308 | 53 | 73 | 13 | 110 | 45 | 1,602 |
| Line 2 | Chefasine tree growers | 0 | 53 | 0 | 2 | 0 | 31 | 86 (1.76%) |
| | Middlemen | 1,308 | 0 | 73 | 13 | 202 | 18 | 1,615 (33.17%) |
| | Hawassa pole wholesalers and retailers | 3,119 | 0 | 24 | 21 | 0 | 5 | 3,169 (65.07%) |
| | Accumulated value | 4,427 | 53 | 97 | 36 | 202 | 54 | 4,869 |

Of the total cost of US $1,602 *Eucalyptus* poles at line one, Tulla pole wholesalers and retailers incur the highest cost of US $ 1,516 (94.63%) while tree growers bear the lowest direct cost US $ 86 (5.36%) of the total cost. At line two, from the total cost of US $ 4,869, Hawassa pole wholesalers and retailers incur the highest cost of US $ 3,169 (65.07%) followed by middlemen US $ 1,615 (33.17%) and tree growers US $ 86 (1.76%) of the total cost. Product purchase cost alone accounts a total of US $ 1,308 (81.65%) and exclusively covered by Tulla pole wholesalers and retailers (100%) for line 1 and for line 2 it accounts for US $ 4,427 of the total cost with the higher proportion at Hawassa pole wholesalers and retailers level (70.45%) followed by middlemen US $ 1,308 (29.55%). Transportation cost comprises US $ 110 (6.86%) for line 1 and US $ of 202 (4.15%) for line 2. Other costs (communication costs, seedling purchase cost and payment for brokers) comprise US $ 45 (2.80%) and US $ 54 (1.11%) for line 1 and line 2, respectively. Labour costs and tax and fees accounted for US $ 126, 150, 13 and 36, for line 1 and 2, respectively. The contribution of costs and margins at Figure 18 indicated the accumulation of higher cost and margin as the level moves from tree grower to consumers for line one and two.




| | Consumers | Tulla pole wholesalers and retailers | Chefasine tree growers | Middlemen | Hawassa pole wholesalers and retailers | Consumers |
|---|---|---|---|---|---|---|
| Margin | 0 | 2,207 | 1,222 | 1,506 | 1,661 | 0 |
| Other costs | 0 | 14 | 31 | 18 | 5 | 0 |
| Transport cost | 0 | 110 | 0 | 202 | 0 | 0 |
| Tax and fees | 0 | 11 | 2 | 13 | 21 | 0 |
| Labour cost | 0 | 73 | 53 | 73 | 24 | 0 |
| Product cost | 3,723 | 1,308 | 0 | 1,308 | 3,120 | 4,831 |

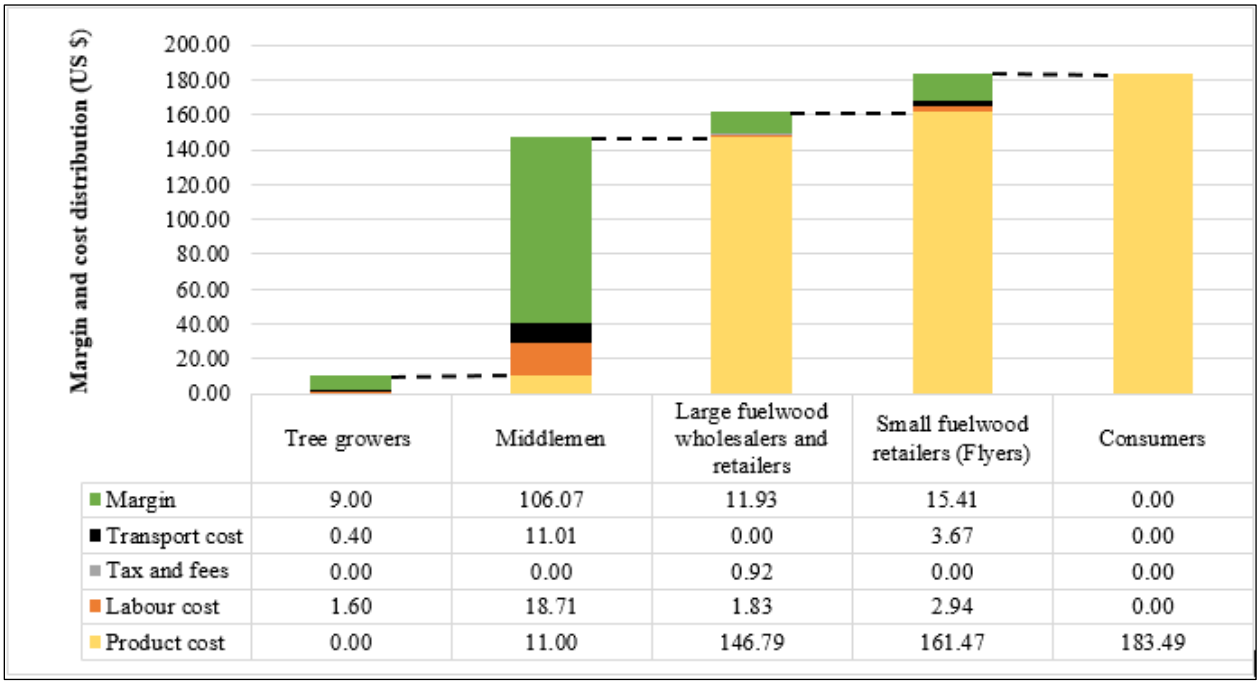
FIGURE 18. COST AND MARGIN DISTRIBUTION BY ACTORS AND SEGMENTS FOR *EUCALYPTUS* POLES FROM CHEFASINE TO TULLA (LINE 1) AND CHEFASINE TO HAWASSA TOWN (LINE 2).

**Cost distribution of *Eucalyptus* fuelwood:** The basic structure of costs involved per 5 donkey cartloads of fuelwood at different actor's level was presented in Table 13. A total cost of US $ 360 (9,810 ETB) incurred for the entire chain from the tree growers up to the small fuelwood retailers level. Of the total cost of US $ 360, small fuelwood retailers incurred the highest cost US $ 168.08 (46.64%). Tree growers, large fuelwood wholesalers and retailers and middlemen incurred the cost by 0.55%, 41.41%, and 11.30% of the total cost respectively.

Table 13. Distribution of costs at different actor levels for *Eucalyptus* fuelwood value chain (US $ per 5 donkey cartloads).

| Actors | Product cost | Labour cost | | Tax and fees | Transport cost | Total cost |
|---|---|---|---|---|---|---|
| | | Family | Hired | | | |
| Tree growers | 0.00 | 1.60 | 0.00 | 0.00 | 0.40 | 2.00 (0.55%) |
| Middlemen | 11.00 | 0.00 | 18.71 | 0.00 | 11.01 | 40.72 (11.30%) |
| Large fuelwood wholesalers and retailers | 146.79 | 0.00 | 1.83 | 0.92 | 0.00 | 149.54 (41.41%) |
| Small fuelwood retailers (Flyers) | 161.47 | 2.94 | 0.00 | 0.00 | 3.67 | 168.08 (46.64%) |
| Accumulated value | 319.26 | 4.54 | 20.54 | 0.92 | 15.08 | 360.34 |

The product purchase cost alone accounts for US $ 319 (88.59%) of the total cost with almost similar structure at large and small fuelwood actor levels. This is followed by formal wages by 6.96% transportation cost by 4.18%. Tax and fees accounted for about 0.25% of the total cost. It indicates the contribution of fuelwood from Chefasine as a revenue for the government is almost negligible. The cost accrued as wages to labourer's level is highest at the middlemen level, accounted for 61.59% of the total cost. The highest margin US $ 106 was accrued at the middlemen level with the lower product cost of US $ 11. However, the large fuelwood wholesalers and retailers, incurred high product cost and received a lower profit (margin) (fig. 19).




| | Tree growers | Middlemen | Large fuelwood wholesalers and retailers | Small fuelwood retailers (Flyers) | Consumers |
|---|---|---|---|---|---|
| Margin | 9.00 | 106.07 | 11.93 | 15.41 | 0.00 |
| Transport cost | 0.40 | 11.01 | 0.00 | 3.67 | 0.00 |
| Tax and fees | 0.00 | 0.00 | 0.92 | 0.00 | 0.00 |
| Labour cost | 1.60 | 18.71 | 1.83 | 2.94 | 0.00 |
| Product cost | 0.00 | 11.00 | 146.79 | 161.47 | 183.49 |

FIGURE 19. COST AND MARGIN DISTRIBUTION ACROSS DIFFERENT ACTORS IN *EUCALYPTUS* FUELWOOD VALUE CHAIN.

### 4.8.4 Value added and its distribution of *Eucalyptus* poles and fuelwood

The value added at each level is the total revenue minus the cost of all the intermediary inputs and services coming outside the chain. The intermediary cost includes product purchase cost, transportation and transaction costs (communication cost). In other way value added is described as the sum of the margin (revenue less expense) of actors, the labour wages and taxes and fees. A detailed description and interpretation of the value added and its distribution for *Eucalyptus* pole and fuelwood value chain is given here below.

#### 4.8.4.1 Value added and its distribution for *Eucalyptus* poles

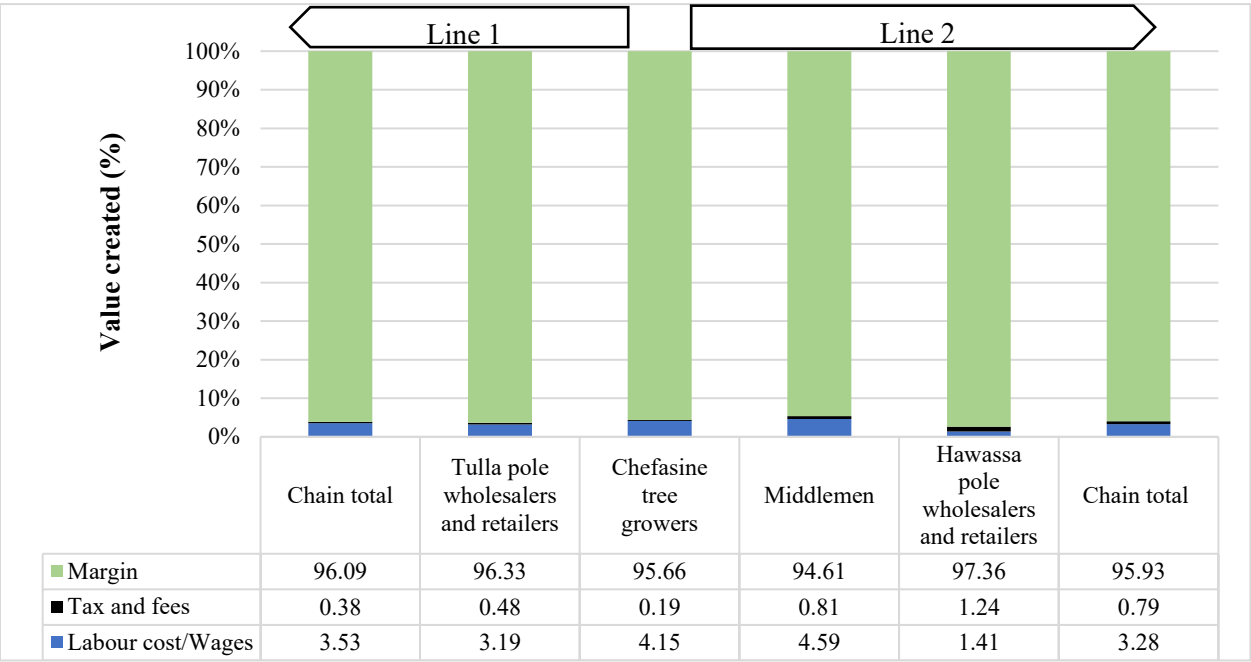
The total value added for the value chain of *Eucalyptus* poles was calculated from Chefasine village up to Tulla and Hawassa pole wholesalers and retailers' level and provided under Table 14 for line 1: Chefasine to Tulla and line 2: Chefasine to Hawassa. The value addition starts from the tree grower level. The total value added was US $ 3,568 (97,228 ETB) and US $ 4,575 (124,669 ETB) for line 1 and line 2, respectively for 5 trucks (approximately 60 $m^3$) of *Eucalyptus* poles. From line 1, Tulla pole wholesalers and retailers realize US $ 2,291 (64.21%) of the value addition, while Chefasine tree growers added value by US $ 1,277 (35.79%) of the value addition. Thus, the highest value addition lies in the production and marketing of *Eucalyptus* pole at the Tulla pole wholesalers and retailers' level. For line 2, Hawassa pole wholesalers and retailers grasp US $ 1,706 (37.30%) of the value addition indicating the highest value addition followed by middlemen accounting US $ 1,592 (34.79%). Tree growers add value by 27.91% (US $ 1,277) in line 1. The lower the value addition at tree growers level indicates the limited value-added processing of *Eucalyptus* production and marketing.

Table 14. Value added at different levels along the chain and its distribution for Chefasine to Tulla (line 1) and Chefasine to Hawassa (Line 2) (US $).

| | Actors | Labour cost | | Tax and fees | Margin | Value added |
|---|---|---|---|---|---|---|
| | | Family | Hired | | | |
| Line 1 | Chefasine tree growers | 53 | 0 | 2 | 1,222 | 1,277 (35.79%) |
| | Tulla pole wholesalers and retailers | 0 | 73 | 11 | 2,207 | 2,291(64.21%) |
| | Chain total | 53 | 73 | 13 | 3,429 | 3,568 |
| Line 2 | Chefasine tree growers | 53 | 0 | 2 | 1,222 | 1,277(27.91%) |
| | Middlemen | 0 | 73 | 13 | 1,506 | 1,592 (34.79%) |
| | Hawassa pole wholesalers and retailers | 0 | 24 | 21 | 1,661 | 1,706 (37.30) |
| | Chain total | 53 | 97 | 36 | 4,389 | 4,575 |

Figure 20 shows the value added and its composition of *Eucalyptus* pole actors of Chefasine for line 1 and line 2, respectively. From line 1, Tulla pole wholesalers and retailers and tree growers reaped profit by 96.33% and 95.66%, respectively. About 3.19% and 4.15% of the value added at Tulla pole wholesalers and retailers and tree growers level goes as a wage of labourers. From line 2, Hawassa pole wholesalers and retailers reaped a profit (97.36%) followed by Chefasine tree growers (95.66%) and middlemen (94.61%). From the total value created in line 2 about 4.59% from the middlemen, 4.15% from the tree growers and 3.28% from the entire chain were delivered as a wage to the labourers whereas the lower proportion was from Hawassa pole wholesalers and retailers accounted only 1.4% from the total value added. From the total value created, the direct actors including tree growers and Tulla pole wholesalers and retailers for line

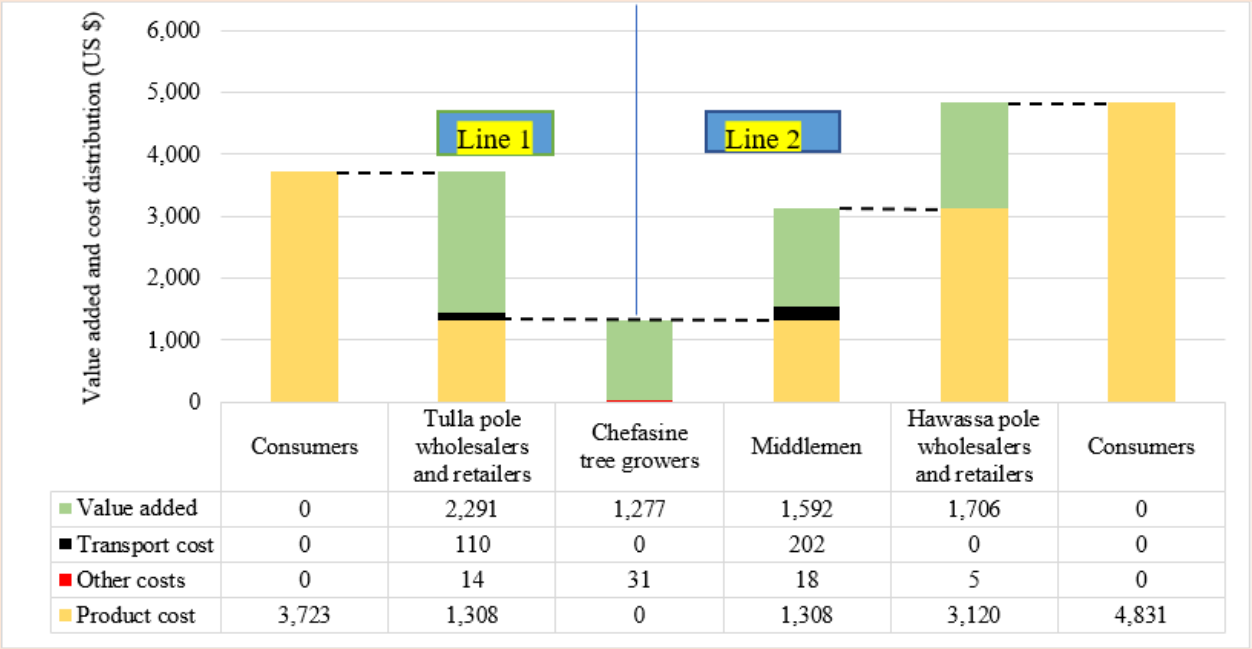
1 reap a total margin of 96.09% and labourers and workers in the form of wages drive 3.53%. Other indirect actors like government capture 0.38% in the way of tax and duties. For line 2, direct actors including Hawassa pole wholesalers, middlemen and tree growers reap a total profit of 95.93%, and workers and labourers captured 3.28% while the indirect actors, like government, realize 0.79% of the total value created in the form of tax and duties. Generally, the high proportion of the added value for all actors goes as a profit to the actors and its contribution to the local revenue in the form of taxes or wage for labourers are very low.




| | Chain total | Tulla pole wholesalers and retailers | Chefasine tree growers | Middlemen | Hawassa pole wholesalers and retailers | Chain total |
|---|---|---|---|---|---|---|
| Margin | 96.09 | 96.33 | 95.66 | 94.61 | 97.36 | 95.93 |
| Tax and fees | 0.38 | 0.48 | 0.19 | 0.81 | 1.24 | 0.79 |
| Labour cost/Wages | 3.53 | 3.19 | 4.15 | 4.59 | 1.41 | 3.28 |

FIGURE 20. VALUE ADDED AND ITS COMPOSITION OF *EUCALYPTUS* POLE ACTORS OF CHEFASINE TO TULLA (LINE 1) AND CHEFASINE TO HAWASSA (LINE 2).

However, the fact that each actor received a higher margin from the total value added, the distribution of the value created along the chain were not proportional. The distribution of cost and value addition for *Eucalyptus* pole value chain from Chefasine is summarised in Figure 21, for l and line 2, respectively. Both, the cost of the pole (product cost) and value addition were increased as the product goes from tree grower to middlemen and wholesalers and retailers.




| | Consumers | Tulla pole wholesalers and retailers | Chefasine tree growers | Middlemen | Hawassa pole wholesalers and retailers | Consumers |
|---|---|---|---|---|---|---|
| Value added | 0 | 2,291 | 1,277 | 1,592 | 1,706 | 0 |
| Transport cost | 0 | 110 | 0 | 202 | 0 | 0 |
| Other costs | 0 | 14 | 31 | 18 | 5 | 0 |
| Product cost | 3,723 | 1,308 | 0 | 1,308 | 3,120 | 4,831 |

FIGURE 21. DISTRIBUTION OF VALUE ADDED AND COST ALONG THE CHAIN FOR LINE ONE AND LINE TWO.

The commercial margin of the actors was also estimated to know the distribution of gains for each actor and presented under Table 15 for line 1 and 2. The calculation of the commercial margin revealed that the total marketing margin is 64.86% and 72.92% for line 1 and 2, respectively, indicating that tree growers who own the tree catch an equivalent of only 35.14% and 27.08% from line 1 and 2, respectively of the final price of the product. In line 1, Tulla pole wholesalers and retailers are the only one competing with the tree growers and captured higher value from the value added. From the second line middlemen and Hawassa pole wholesalers and retailers reap 37.52% and 35.40%, respectively, indicating higher commercialisation margin at the middlemen level.

Table 15. Commercialisation margin of *Eucalyptus* pole for different actors along the chain at line one and line two.

| Actors | | Average price | | Commercialisation margin | |
|---|---|---|---|---|---|
| | | Purchase | Sale | US $ | % |
| Line 1 | Chefasine tree grower | | 1,308 | | |
| | Tulla pole wholesaler and retailer | 1,308 | 3,723 | 2,415 | 64.86 |
| | Total value | | | 3,723 | 100 |
| Line 2 | Chefasine tree grower | | 1,308 | | |
| | Middlemen | 1,308 | 3,120 | 1,812 | 37.52 |
| | Hawassa pole wholesaler and retailer | 3,120 | 4,830 | 1,710 | 35.40 |
| | Total value | | | 3,522 | 72.92 |
| | | | | 4,830 | 100 |

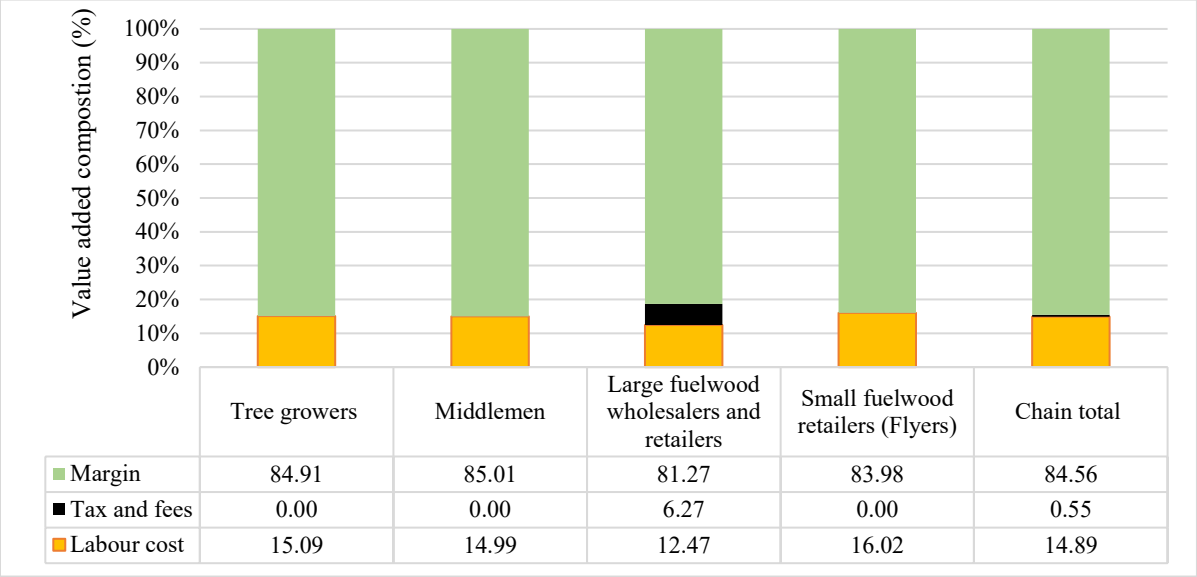
#### 4.8.4.2 *Eucalyptus* fuelwood value added and its distribution

In this section, *Eucalyptus* fuelwood value added, and its composition was presented and discussed from the tree grower up to small fuelwood retailer level (Table 16 and fig. 22.). The total value added realised per 5 donkey cartloads of fuelwood from the entire chain was US $ 168.41 (4,539 ETB). Of the total US $ 168.41 value added, middlemen accrued US $ 124.78 (74.09%) while tree growers, large fuelwood wholesalers and retailers and small fuelwood retailers accumulated US $ 10.60 (6.29%), 14.68 (8.72%) and 18.35 (10.90%), respectively. These indicate, the limited and low level of value addition processing at the level of tree growers, large fuelwood wholesalers and retailers and small fuelwood retailers. The highest value addition lies in the production and marketing of *Eucalyptus* fuelwood at the middlemen level. Felling, debranching, splitting, loading and unloading and transporting are the value addition processing activities performed by the middlemen.

Table 16. Value added of *Eucalyptus* fuelwood at different levels along the chain and its distribution (US $).

| Actors | Wages | Tax and fees | Margin | Total value added |
|---|---|---|---|---|
| Tree growers | 1.60 | 0.00 | 9.00 | 10.60 (6.29%) |
| Middlemen | 18.71 | 0.00 | 106.07 | 124.78 (74.09%) |
| Large fuelwood wholesalers and retailers | 1.83 | 0.92 | 11.93 | 14.68 (8.72%) |
| Small fuelwood retailers (Flyers) | 2.94 | 0.00 | 15.41 | 18.35 (10.90%) |
| Chain total | 25.08 | 0.92 | 142.41 | 168.41 |

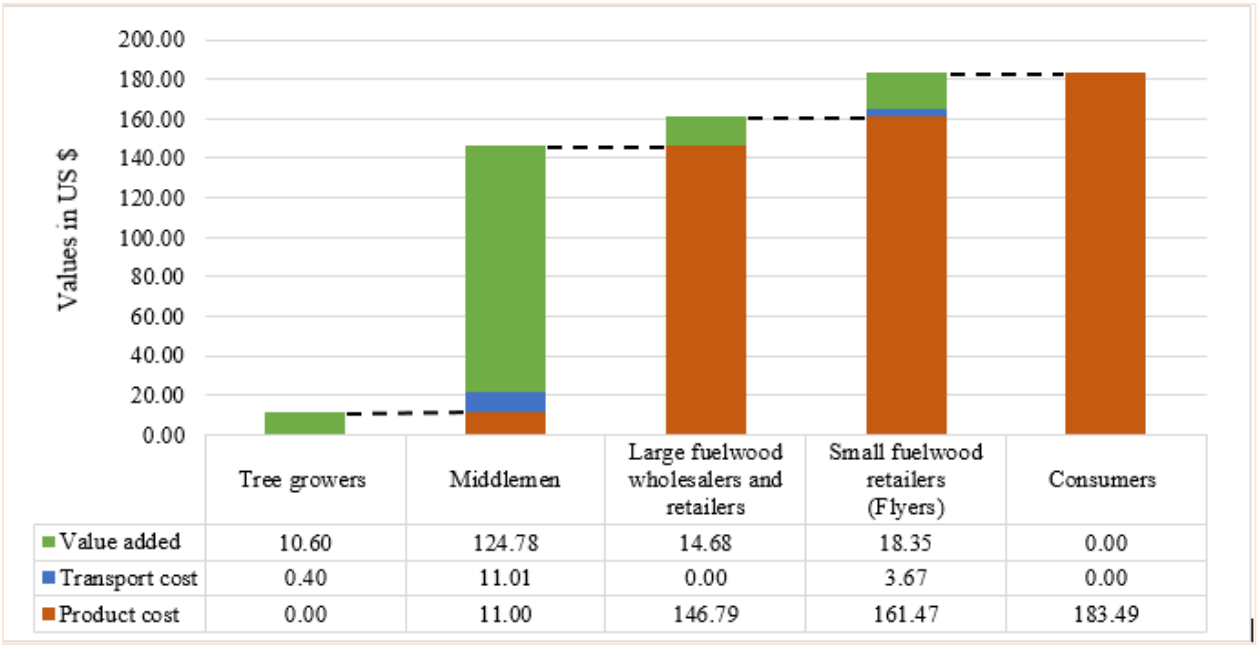
From Figure 22, it was observed that a high proportion of the added value goes to the actor's tree growers, middlemen, large and small fuelwood wholesalers and retailers as margin. From the total value created in the chain (US $ 168.41), US $ 142.41 (84.56%), US $ 25.08 (14.89%) and US $ 0.92 (0.55%) goes as margin, a wage for labourers and as government revenue in the form of tax. From the total value added, middlemen, large fuelwood wholesalers and retailers, small fuelwood retailers and tree growers realised (US $ 106.07 (85.01%), 11.93 (81.27%), 15.41 (83.98%) and 9 (84.91%)) of margin, respectively. The small proportion of revenue for the government could be due to the lack of controlled and systematic tax collection system. Labourers captured 15% of the value created at the middlemen level.




| | Tree growers | Middlemen | Large fuelwood wholesalers and retailers | Small fuelwood retailers (Flyers) | Chain total |
|---|---|---|---|---|---|
| Margin | 84.91 | 85.01 | 81.27 | 83.98 | 84.56 |
| Tax and fees | 0.00 | 0.00 | 6.27 | 0.00 | 0.55 |
| Labour cost | 15.09 | 14.99 | 12.47 | 16.02 | 14.89 |

FIGURE 22. VALUE ADDED AND ITS COMPOSITION OF *EUCALYPTUS* FUELWOOD AT DIFFERENT LEVELS ALONG THE CHAIN.

Unlike the *Eucalyptus* pole, in *Eucalyptus* fuelwood value chain, higher value addition was created at the middlemen level (US $ 124.78, 3,400 ETB) and lower at the wholesalers and retailers' level (US $ 14.68 (400 ETB) and 18.35 (500 ETB)), respectively. But, the product cost increase along the chain (fig. 23).




| | Tree growers | Middlemen | Large fuelwood wholesalers and retailers | Small fuelwood retailers (Flyers) | Consumers |
|---|---|---|---|---|---|
| Value added | 10.60 | 124.78 | 14.68 | 18.35 | 0.00 |
| Transport cost | 0.40 | 11.01 | 0.00 | 3.67 | 0.00 |
| Product cost | 0.00 | 11.00 | 146.79 | 161.47 | 183.49 |

FIGURE 23. DISTRIBUTION OF VALUE ADDED AND COST ALONG THE CHAIN FOR *EUCALYPTUS* FUELWOOD.

The analysis of the relative commercialisation margin of the actors in Table 17 shows 94% of the domestic consumer price captured by the traders and therefore the equivalent value captured by tree growers

(producers) is about 6%. Middlemen level is the main segment of the *Eucalyptus* fuelwood marketing chain, with 74% commercialisation margin, followed by small fuelwood retailers (12%) and large fuelwood wholesalers and retailers (8%). From this, it can be seen that the market characteristics limit producers' share in the final price of the product.

Table 17. Commercialisation margin of *Eucalyptus* fuelwood for different actors along the chain (2.4 Tone).

| Actors | Average price | | Commercialisation margin | |
|---|---|---|---|---|
| | Purchase | Sale | US $ | % |
| Tree grower | | 11 | | |
| Middlemen | 11 | 147 | 136 | 74 |
| Large fuelwood wholesaler and retailer | 147 | 162 | 15 | 8 |
| Small fuelwood retailers (flyers) | 162 | 184 | 22 | 12 |
| | | | 173 | 94 |
| Total value | | | 184 | 100 |

## 4.9 The roles of *Eucalyptus* pole and fuelwood business to actor's livelihood strategies

### 4.9.1 The livelihood strategies of actors

**Tree growers.** Chefasine farmers have been practicing different livelihood strategies for a long-time including homestead agroforestry (HAF's) such as vegetables, enset, coffee and khat, plating of fruit trees like banana, avocado and gesho and trees like cordia, crop farming like haricot bean and maize, livestock keeping (animal and animal products) and woodlot (fig. 24). Moreover, non-farm activities including training, remittance others are additional sources of livelihood for the Chefasine farmers. HAF's is the dominant livelihood strategy practised in the village whereby the traditional home garden of enset-coffee-based agroforestry system dominated. All the respondents have practised homestead agroforestry-based farming system of coffee enset and khat farming.

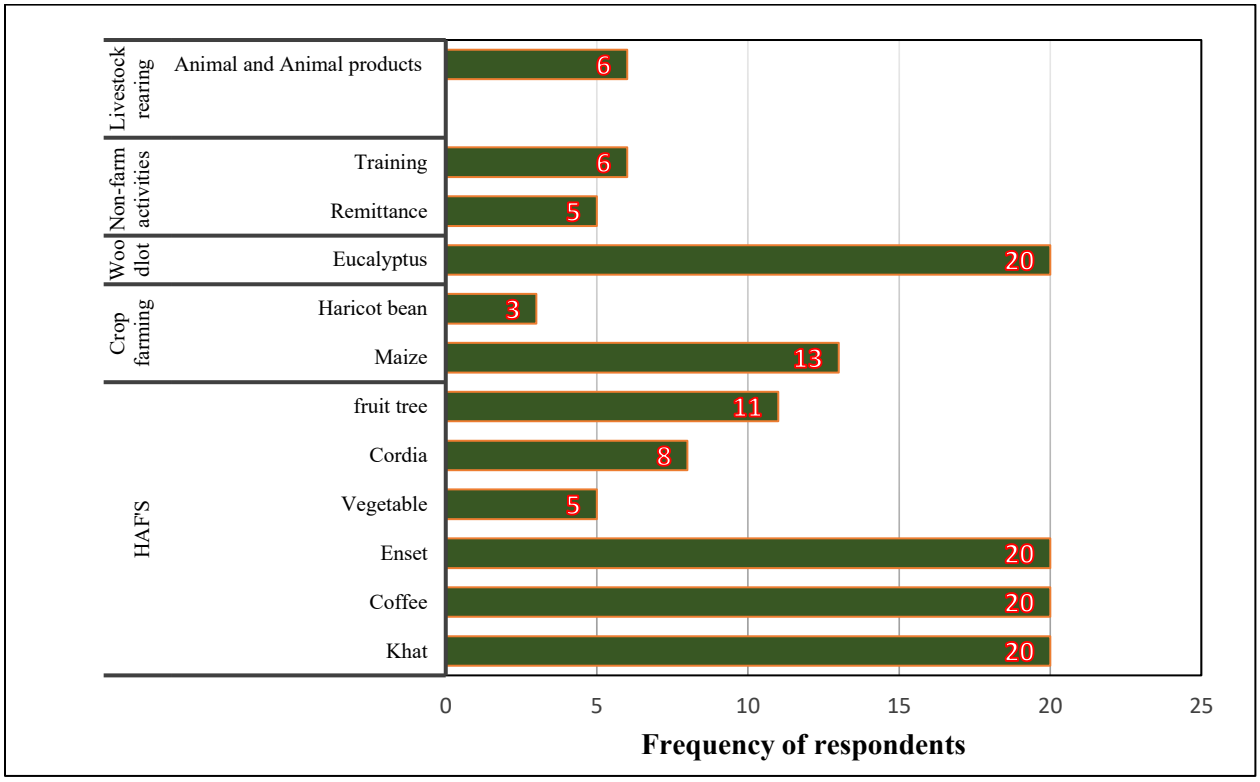



FIGURE 24. LIVELIHOOD STRATEGIES OF CHEFASINE TREE GROWER.

**Traders:** The main livelihood activity of the traders are pole and fuelwood trading; transporting, distribution and vending. About 88% of the respondents confirmed that *Eucalyptus* poles and fuelwood marketing are their main livelihood activity. Farming and transporting other products as well as trading of goods and commodities were the additional source of their livelihood strategies for the few of Tulla pole wholesalers and retailers, transporters and middlemen. However, the livelihood strategies of all the large fuelwood wholesalers and retailers, small fuelwood retailers and Hawassa pole wholesalers and retailers were 100% composed by *Eucalyptus* pole and fuelwood business activities.

### 4.9.2 Contribution of *Eucalyptus* pole and fuelwood for the livelihood of actor's

#### 4.9.2.1 *Eucalyptus* pole and fuelwood contribution for the livelihood of Chefasine tree growers.

Woodlots in Chefasine have several contributions for the livelihood of the farmers. Tree growers in Chefasine has planted *Eucalyptus* for income generation (16%), construction (15%), fuelwood (14%), for fencing and shading (9%), for soil conservation (8%) as well as to make farming equipment's (5%) (fig. 25). In addition to this, tree growers were mentioned other functions (24%) including shelter or windbreak, reduce deforestation, saving, seed production, bonfire (Demera), storage facilities, scaffolding, furniture making and job creation.

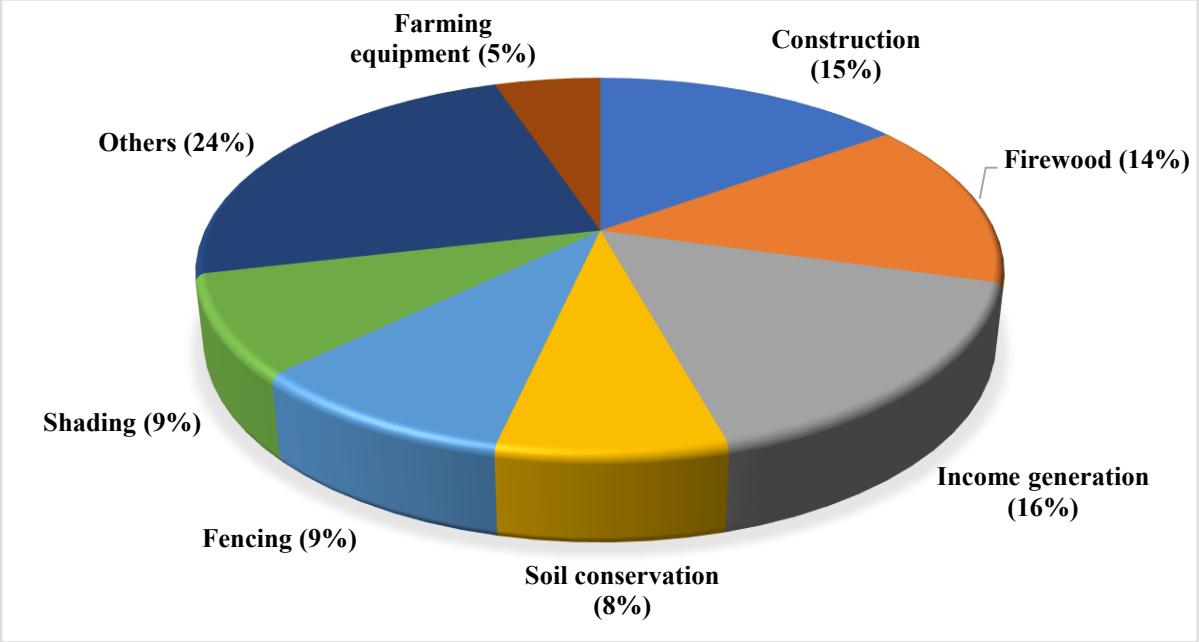



FIGURE 25. CONTRIBUTION OF *EUCALYPTUS* FOR CHEFASINE TREE GROWERS LIVELIHOOD.

Thus. *Eucalyptus* pole and fuelwood contributed for tree growers of Chefasine mainly for income generation, construction, fuelwood, fencing, saving and others.

#### 4.9.2.2 Income contribution of *Eucalyptus* products to tree grower's livelihood

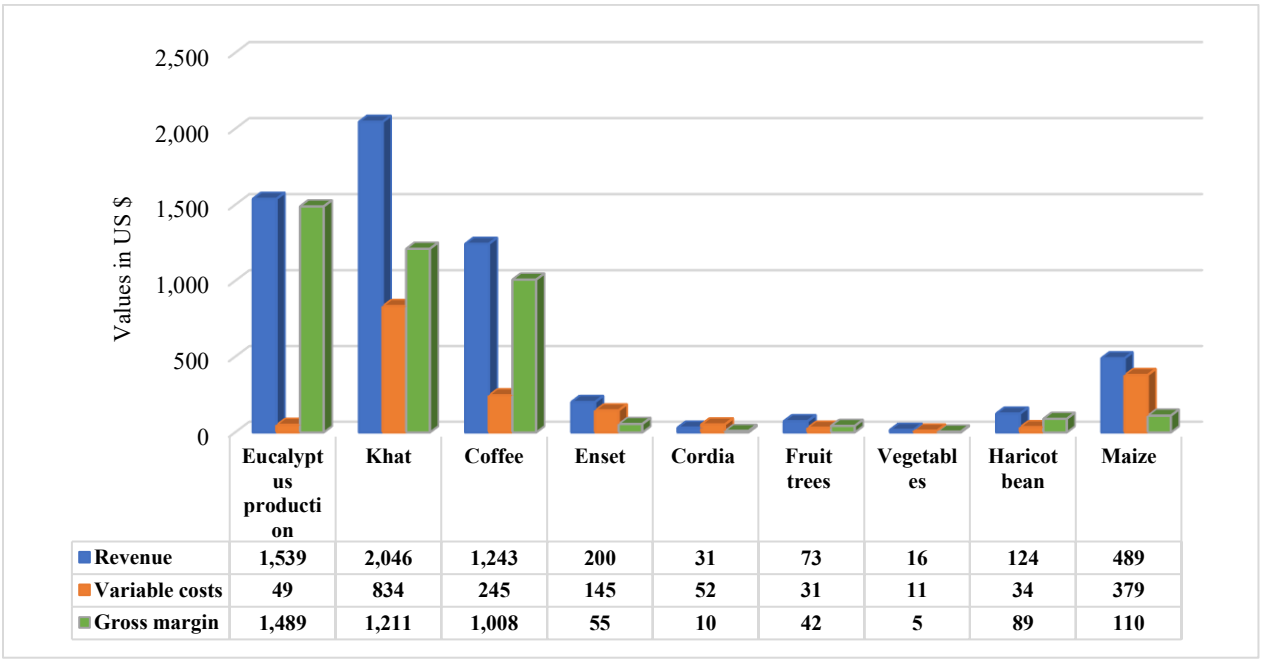
Since in the last decades there has been a massive drive by the government to improve the benefits of smallholder farmers through intensified farming (supply of fertiliser and improved seeds) system. Chefasine kebele was one of the beneficiaries of this drive to increase the productivity of crops like coffee, khat, enset, maize and others. There is also high demand for *Eucalyptus* in the area mostly for construction and fuelwood. Therefore, it was found to be interesting to do the economic analysis of different livelihood strategies of Chefasine tree growers to know if it is profitable to grow *Eucalyptus* as compared to other crops livelihood portfolios. When carrying out the investigation, assumptions 1) a farmer who invests in khat production will collect two times in a year; hence the gross margin of khat was estimated by doubling the seasonal amount 2) farmers have adopted the intensified farming methods guaranteeing them high yields under favourable weather conditions and 3) the perennial crops will remain productive for the expected lifespan were considered. Table 18 shows the expected productive lifespan for the analysed perennial crops in Chefasine kebele which were used to amortise the establishment costs. All the costs before the perennial crops gave any yields treated as establishment costs. The expected lifespan of each perennial crops has decided during the key informant interview with Chefasine village experts and development agency.

Table 18. Expected productive lifespan of different crops.

| No. | Perennial crop | Expected lifecycle |
|---|---|---|
| 1 | Coffee | 25 |
| 2 | Khat | 30 |
| 3 | Enset | 6 |
| 4 | *Eucalyptus* | 5 |
| 5 | Fruit trees | 15 |
| 6 | Cordia | 20 |

Source: Discussion with key informant interview of village expertise and development agents.

A summary of the benefit, cost and gross margin analysis for all the selected crops per hectare per year was shown in Figure 26, and the calculations for individual crops were found in the appendices part (Appendix III). The cost of land and capital over the years for the perennial crops were not included for the calculation of gross margin. As it was seen from Figure 26 clearly, *Eucalyptus* production has a higher gross margin of on the average US $ 1,489 (40,575) per year per hectare followed by khat US $ 1,211 (32,999 ETB) and coffee and 1,008 (27,468 ETB) per year per hectare. The lowest gross margin was observed from vegetables, *Cordia africana*, enset, fruit trees and haricot bean farming systems US $ of 5, 55, 10, 42 and 89, respectively.




| | Eucalyptus production | Khat | Coffee | Enset | Cordia | Fruit trees | Vegetables | Haricot bean | Maize |
|---|---|---|---|---|---|---|---|---|---|
| Revenue | 1,539 | 2,046 | 1,243 | 200 | 31 | 73 | 16 | 124 | 489 |
| Variable costs | 49 | 834 | 245 | 145 | 52 | 31 | 11 | 34 | 379 |
| Gross margin | 1,489 | 1,211 | 1,008 | 55 | 10 | 42 | 5 | 89 | 110 |

FIGURE 26. GROSS MARGIN, REVENUE AND VARIABLE COST OF SELECTED CROPS IN CHEFASINE.

The average income percentage distributions of different livelihood portfolios of Chefasine tree grower were found under Figure 27. Home-based agroforestry practice were the leading sources of revenue for the tree growers (55%) followed by *Eucalyptus* (35%). Crop farming, animal and their products and non-farm

activities cover the lowest percentage of gross income sources (5%, 3% and 2%), respectively. It implies that, although tree growers have different income-earning livelihood strategies, woodlot is the second leading and dominant sources of income following HAF's. However, when the contribution of each crop was analysed separately, the gross margin from *Eucalyptus* (US $ 1,489) becomes higher than the other followed by khat (US $ 1,211) and coffee (US $ 1,008) (fig. 26). It is due to the lower variable cost, incurred for the production of *Eucalyptus* (US $ 39) (fig. 26). Several studies in Ethiopia (Demamu 2002; Mekonnen et al. 2007; Zerihun 2010; Mekonnen 2013 and Abiyu et al. 2015), proved the profitability of *Eucalyptus* plantation as compared to other production option (crops and animals) of the smallholder farmers.

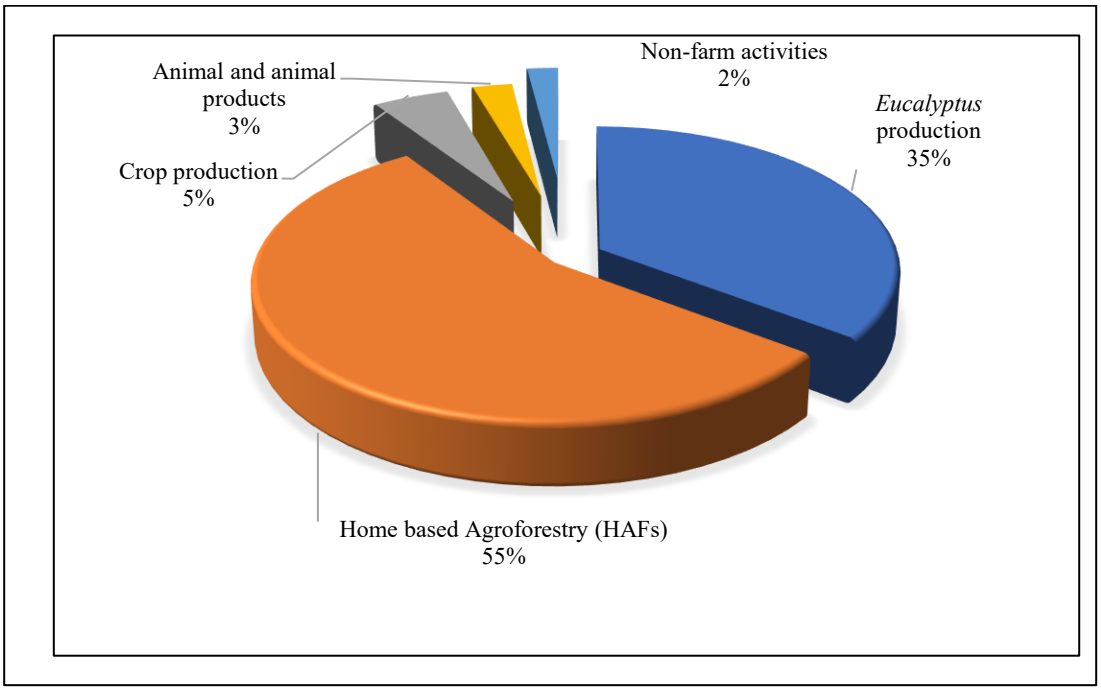



FIGURE 27. THE AVERAGE INCOME DISTRIBUTION OF DIFFERENT LIVELIHOOD PORTFOLIOS OF CHEFASINE TREE GROWERS.

The income generated from the sale of *Eucalyptus* products has used for purchasing household consumption materials (clothes, food and other equipment) (17%), input material for farming (such as: improved seed (11%) and fertiliser (12%)), livestock's (7%), for medical and health cares (11%), school fees and house rent (15%) and for purchasing of construction materials like steel (10%). Also, tree growers used the income from *Eucalyptus* to purchase a house in towns, motorcycle, land, to return credit as well as to buy agricultural input supplements and for social events such as equb and edir (fig 28).

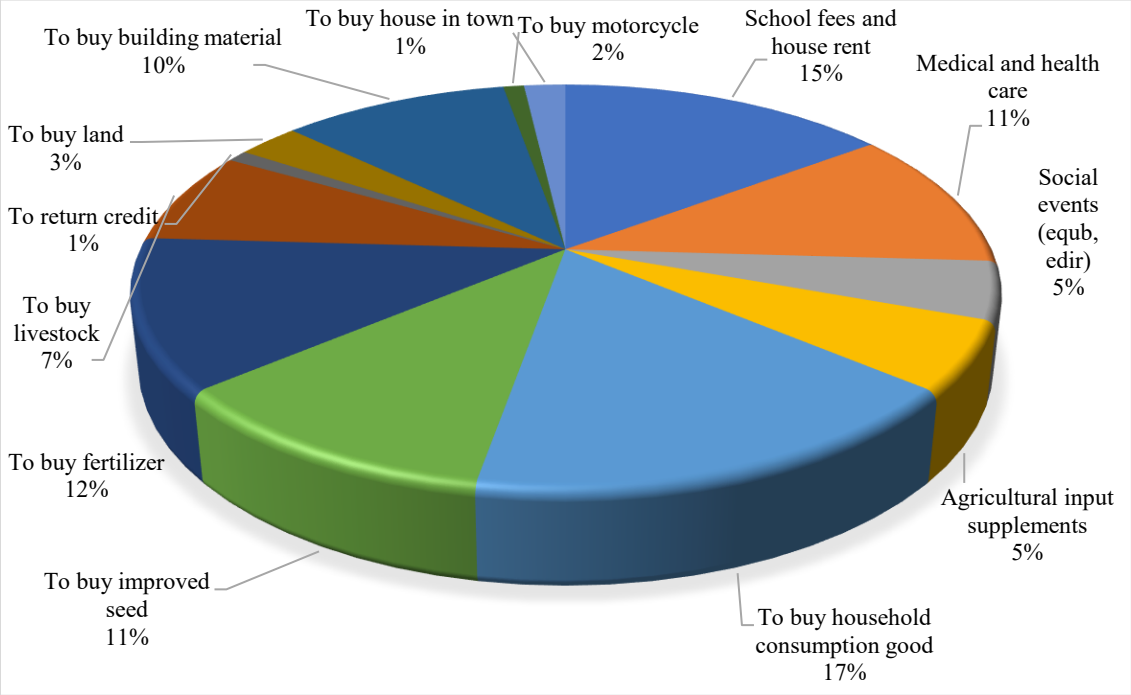



FIGURE 28. THE LIVELIHOOD CONTRIBUTION OF INCOME GENERATED FROM THE SALE OF *EUCALYPTUS* TO CHEFASINE TREE GROWERS

### 4.9.2.3 Contribution of *Eucalyptus* pole and fuelwood for the livelihood of trader's

The contribution of *Eucalyptus* pole and fuelwood for traders was mainly for income generation and construction. The income generated from the sale of *Eucalyptus* pole and fuelwood has used for the purchase of household consumption goods (food, cloth and health) (22%), house (21%), payment for education and house rent (17%), and for saving (16%). As well as to purchase a car and motorbike, land and to help others (12%, 10% and 2%), respectively (fig. 29).

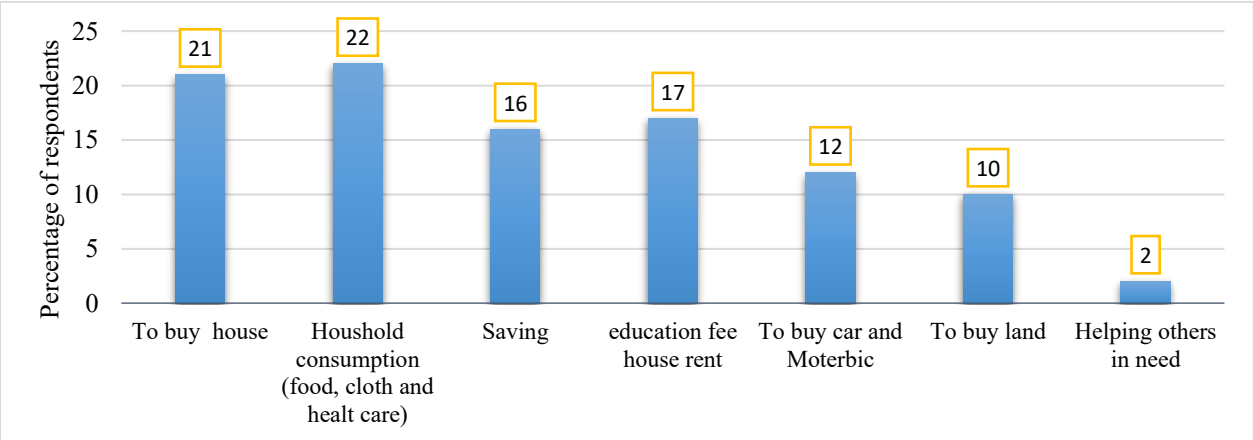



FIGURE 29. THE CONTRIBUTION OF INCOME FROM THE SALE OF *EUCALYPTUS* POLE AND FUELWOOD FOR TRADER'S LIVELIHOOD.

## 4.10 Regulating and supporting environment of *Eucalyptus* poles and fuelwood value chain

The business environments including the regulating and supporting environment of the value chain of *Eucalyptus* pole and fuelwood were summarised in the following table (Table 19).

Table 19. Existing business environment for the value chain of *Eucalyptus* pole and fuelwood from Chefasine.

| **Business environment** | **Organizations** | **Role and responsivities** |
|---|---|---|
| **Regulating environment** | Government (Land administration committee at Chefasine kebele) | Providing land use right for tree growers.<br>Setting rules and regulations for *Eucalyptus* planting. |
| | Ministry of Trade at Tulla and Hawassa | Arranges and provides transport and trade license and permit for middlemen, wholesalers and retailers of pole and fuelwood. |
| | Hawassa City Revenue and Customs Authority (HCRCA) | Collecting tax from tree growers, middlemen, and wholesalers and retailers of pole and fuelwood. |
| **Supporting environment** | Commercial Bank of Ethiopia (CBE) | Arranging and providing credit for middlemen, wholesalers, and retailers of the pole and fuelwood |
| | Hawassa City Administration | Provides a vending area for pole wholesalers and retailers of Hawassa. |
| | Ethiopian Road Authority | Constructed the main road that passes through Chefasine |
| | Ministry of Environment Forest and Climate Change (EEFCC) | Research and development: Have planned to give training and support (seedling provision and technical support) to tree growers (not solely for *Eucalyptus*). |
| | Customers | Thriving construction industry. |
| | Input providers | Provided seeds and seedlings to tree growers |

The regulating environments included: formal regulations such as trade and transport permits, tax, land use right and regulations on *Eucalyptus* planting are exiting in the value chain of *Eucalyptus* poles and fuelwood. Informal regulations such as rules and norms which were not in place for this case. Government (Land administration committee at Chefasine kebele) regulates the chain by allowing or granting land user rights (tenure security) to the tree growers. It enables them to plant, utilise and benefit from the *Eucalyptus* trees plantation. Ministry of Trade at Tulla and Hawassa arranges and provides transport and trade permission or license for the middlemen and wholesalers and retailers of *Eucalyptus* pole and fuelwood.

The Commercial Bank of Ethiopia arranges and provides a financial loan to traders for their startup work, however, most of the traders, particularly wholesalers and retailers are not interested and happy for the service. It is because traders have to pay the loan to the bank after two years whether they are profitability or not. Tree growers did not receive any financial support from anybody. The absences of any credit institution for tree growers in need of money enforces them to harvest the stand in an earlier age such as at the age of three.

Collecting tax and charges from the middlemen and wholesalers and retailers of pole and fuelwood is regulated by Tulla and Hawassa City Revenue and Customs Authority. Supporting environments including state extension, research, NGO's and associations are not functioning in the village for *Eucalyptus* production and marketing. The extension workers, researchers and NGO's are focussing on coffee, enset and other crops. The agricultural extension workers of Chefasine, Mr. Agiso Hassen, stated that '*in the past, there was a tree nursery for Eucalyptus by government and NGO's producing and providing free Eucalyptus seedlings to tree growers, but currently they are not producing and providing,* as the support stopped from both government and NGO's. According to the newly established, Hawassa Ministry of Environment, Forest and Climate Change, there is no particular plan for *Eucalyptus,* however, has planned to produce and disseminate seedlings and provide training to farmers in the region. Moreover, the government has enacted a law to encourage forest investment through mechanisms such as lease-free land, better access to land use and forest ownership certificates and tax grace until the initial harvest (for private investors and associations) and the second harvest (for smallholders and communities).

Most of the tree growers (70%) did not have market information about *Eucalyptus* marketing. The lack of market information and knowledge together with the absence of a support organisation for example on technical aspects and financial aspects limit their value addition processing activities like harvesting and transporting to the market. In turn, it reduces the share of profit from the final sale of their products. On the other hand, the small financial support and availability of licenses for traders (middlemen for pole and fuelwood and pole wholesalers and retailers) helped them to have high benefit sharing from the final sale of the products.

## 4.11 Access and governance of the value chains

### 4.11.1 Mechanisms of access control and maintenance

The value chain of *Eucalyptus* pole and fuelwood from Chefasine kebele involves the participation of various direct and indirect actors (section 4.7). These different actors were used different mechanisms to control and maintain benefits derived from *Eucalyptus* pole and fuelwood value chain. They generate income or profit by various means of access maintenance and control. Access mechanism refers all means such as social ties, social identity knowledge, skill, credit, permit, license, quotas, collusion and so forth by which an actor can benefit from the thing (Ribot and Peluso 2003). Benefits in the *Eucalyptus* pole and fuelwood value chain are derived from access to the land, access to labour opportunity, access to capital, market, information as well as knowledge, skills, social relation and working environment. A summary of the mechanisms of access maintenance and control used by the different actors along the *Eucalyptus* pole and fuelwood is presented in Table 20 and elaborated in detail hereafter.

**Tree growers (farmers):** In Ethiopia, the government is the owner of the land, but every individual has the right to use the land according to the rules and regulation of the government. Tree growers in Chefasine have the legal right to plant and sell *Eucalyptus* on their land. By using this land access right to use, they plant *Eucalyptus* and get the selling price of their *Eucalyptus* tree from middlemen, pole and fuelwood wholesalers and retailers as well as from consumers. It is the legal access to those who have land user right. No one enforces them to sell their stand, he or she can sell his or her *Eucalyptus* tree to anyone at any time and price. The interviewed tree growers indicated that the price of their *Eucalyptus* stand is determined by buyers and have little space for bargaining. They noted that they are restricted to sell their *Eucalyptus* tree to any potential consumer due to various reasons. These include lack of access to storage space and license for selling of their product as well as a shortage of capital and lack of market information. It is also challenging to manage transport, labourer and built a relationship with potential customers like constructors and service providers. Additionally, lack of vehicles and unreliable public transportation, lack of skill and knowledge about the market situation of *Eucalyptus* products makes the tree growers sell their *Eucalyptus* stand in low price.

Table 20. Mechanisms of access maintenance and control in the *Eucalyptus* pole and fuelwood value chain.

| | |
|---|---|
| Tree growers | *Eucalyptus* stand access control |
| | Law based property right to plant and sell *Eucalyptus* |
| Labourers | Maintenance of access to middlemen, wholesaler and retailer and consumers |
| | Working skill and experiences |
| | Working environment and time |
| Transporter | Maintenance of access to middlemen and pole and fuelwood wholesaler and retailers |
| | Working environment |
| | working capital/resource/Car |

| | |
|---|---|
| Middlemen | Maintenance of access to tree grower, labourer, transporter and wholesaler and retailers of pole and fuelwood<br>Access to capital<br>Social identity<br>working environment<br>Access to labourer<br>Local knowledge and skill to deal with the farmers |
| Pole wholesaler and retailer | Maintenance of access to middlemen's<br>Trading license and permit<br>Access to capital<br>Credit arrangement<br>Social identity and tie with tree growers and states officials<br>Working environment and proximity to Chefasine |
| Fuelwood wholesaler and retailer | Maintenance of access to middlemen<br>Working environment |
| Government | Control of access to regulatory tax and maintenance of access to the middlemen's and Tulla and Hawassa pole wholesalers and retailers and large fuelwood wholesalers and retailers<br>Low based right to tax |

**Labourers**: are an essential group of actors in the value chain of *Eucalyptus* pole and fuelwood value chain in the study area, although *Eucalyptus* production is not a labour-intensive work. Labourers in the kebele include students and low-income farmers who also have limited access to credit and capital to invest in another investment. Also, Tulla and Hawassa town labourers are not a permanent resident in the town and do not have access to credit and capital. It prohibited them to have a license or permission of *Eucalyptus* business (marketing). Thus, they used the labour opportunities to gain access to the resource and the benefit from production and marketing. According to Ribot and Peluso (2003), access to labour opportunity embraces the ability to maintain access to employment with others. Due to their main skill and experiences in harvesting, debranching and pilling, splitting, loading and unloading they are involved in the processing of *Eucalyptus* pole and fuelwood products. All the labourers in the village are from the village and are readily available at any time when the buyer needs labourer.

**Middlemen:** These actors have some exposure to the market and hold knowledge about the availability of products. Social identity, social relationship, access to capital and labourers and their link to the Hawassa pole wholesalers and retailers help them to enter the chain and maintain access from *Eucalyptus*. Besides, they stated that they have a unique skill to deal and keep good social relation as well as the particular ability for bargaining. It was observed that, to work independently, at least US $ 624 (17,000 ETB) is required as capital to deal a truck of *Eucalyptus* pole.

**Pole wholesalers and retailers:** These actors have different means of maintenance and access from *Eucalyptus* pole and fuelwood resource originated from Chefasine. They gain access through trading permits and licenses. They also used their social relationship and ties to the tree growers, access to capital, working environment and proximity to Chefasine to get into the *Eucalyptus* pole trading business and reap

the benefit. Tulla pole wholesalers and retailers are from the Chefasine villages now lived in the town. Most of them have recognised by the tree growers and have access to capital and license for marketing of *Eucalyptus* products. The proximity to Chefasine, social tie with the tree grower and the opportunity to obtain license helped them to maintain access to the resource and reap the benefit. Hawassa pole wholesalers and retailers use access to capital, social tie with government bodies and working environment to get in the business and receive benefit. Like Tulla pole wholesalers and retailers, access to capital and permanent residence in Hawassa helped them to have a license for *Eucalyptus* trading and grape benefit from the products. Besides, the better information and know-how on *Eucalyptus* marketing helps them to compete well with the newcomers and maintain their access and control over benefit from *Eucalyptus* pole and fuelwood.

**Transporters:** Transporters used the resource like trucks to reap benefit from *Eucalyptus* pole and fuelwood value chain. Most of the middlemen, pole and fuelwood wholesalers and retailers do not have their own truck for transportation, and thus transporters control access to *Eucalyptus* products by transporting. Also, they maintain access to middlemen, pole and fuelwood wholesalers and retailers as well as to the customers. However, ttransport of *Eucalyptus* products is not the main job of the transporters thus, the competition between them is minimal.

**Large fuelwood wholesaler and retailer:** These actors used their working environment and social tie to the middlemen and consumers to reap benefit from *Eucalyptus* fuelwood value chain.

**Government agency:** For the marketing of *Eucalyptus* pole and fuelwood permission and licensing documents are required from the government agencies. Thus, they have a legal right based to access benefit from *Eucalyptus* resource through taxes and other fees. Fuelwood wholesalers and retailers paid 5 ETB (US $ 0.18) per donkey cartload. However, they are controlled by the customs authority during market days only. Three donkey cartloads per day were received by the large fuelwood wholesalers and retailers, according to the survey result. It means, in a week, large fuelwood wholesalers and retailers can have 21 donkey cartloads and 90 donkey cartloads per month. Thus, it is possible to earn US $ 198 (5,396 ETB) per year from fuelwood market. Middlemen and wholesalers and retailers of pole indicated that they are paying US $ 1.84 to US $ 3.67 (50 ETB to 100 ETB) per truck. It means, they have contributed US $ 9 to 20 (245 to 545 ETB) per year from a hectare. Apart from the legal government official charges, unofficial charges and fees for the maintenance of good access and linkage between the government agents and traders were observed.

### 4.11.2 Coordination and power distribution of the value chain.

The coordination and power distribution of *Eucalyptus* pole and fuelwood value chain from Chefasine kebele were assessed by using information on the price determination, control and concentration of power as well as the ways of negotiation and exchange. As stated above (fig. 17) *Eucalyptus* marketing was carried out with negotiation and bargaining. Information about the price of *Eucalyptus* flows from the trader to the tree growers, while for the availability of *Eucalyptus* products information flows from the tree growers to the traders. During negotiation tree growers are the first price cutters for their stand using their experience and information from their relatives and neighboured (80%) (Table 21). It is because they did not have enough market information about *Eucalyptus* marketing. The in-depth interview confirmed that from 20 tree growers only six (30%) of them have access to market information. However, this discussion and negation, the power of bargaining are still in the hands of the buyers and they determine the final price. Tree growers have low bargaining power (15%). Also, the lack of collaboration in and among tree growers to market their product made them dependent on the buyer's decision. The survey result confirms, the absences of cooperation (horizontal coordination) (100%) for *Eucalyptus* production and marketing in and among tree growers, while traders organised for getting permission and a license from the government. However, after they have the permit, they are not more cooperated in the business. It leads the financially incapable traders to leave the market and those with enough capital to stay in the market and grasp benefit. Moreover, 80% of the tree growers mentioned that lack of license and vending area limited them to sell the products in the market.

Table 21. Characteristics of tree growers

| Tree grower Characteristics | Respondents | | Percentage |
|---|---|---|---|
| Market information about *Eucalyptus* | Yes | 6 | 30 |
| | No | 14 | 70 |
| From whom | Friends | 6 | 30 |
| | Direct visit from the market | 4 | 20 |
| | Experience | 10 | 50 |
| The way of selling | Through bargaining | | 100 |
| Bargaining power | Yes | 3 | 15 |
| | No | 17 | 85 |
| Collaboration | Yes | 20 | 100 |
| | No | 0 | 0 |
| Reason not to sell to the market | No License | 1 | 5 |
| | No place | 2 | 10 |
| | Lack of skill and knowledge | 1 | 5 |
| | Both (no license and place) | 16 | 80 |

### 4.11.3 Value chain governance

This section examines the governance type of the *Eucalyptus* pole and fuelwood value chains. At stated above in the access mechanism, the middlemen and wholesalers and retailers have the privilege for access to finance and market information through which they can easily establish a relationship with other actors and can gain higher power by dealing with large volume of products. Gereffi (1999) made a distinction between two types of value chains under his discussion of value chain governance. These are producer driven and buyer-driven value chains. In the trade of *Eucalyptus* pole and fuelwood, both middlemen and wholesalers and retailers are leaders. Their strategic information and financial dominancy keep them in the leading position and control the power of bargaining. As stated in the literature review part, Gereffi et al. (2005) described the three factors that are important to explain the types of governance of value chains. These are the complexity of the interfirm transaction, potential of codifying transaction and the capabilities of suppliers. These variables are measured based on the locally set indicators provided in Table 22 below.

Table 22. Variables and indicators for value chain governances

| Variables | Indicators |
|---|---|
| Complex of transaction | The degree of task complexity and asset specificity |
| Potential of codifying information | Easiness of information flow, mode of price determination, simplicity of exchange, mode of communication |
| Capability of suppliers | Access to *Eucalyptus* land, access to input resource like a seedling, capital etc. |

Source: Gereffi et al. (2005).

**Complexity of transaction:** Since the transactions between tree growers and traders (middlemen and pole wholesalers and retailers) is based on the stumpage price of the woodlot, the degree of complexity of the task for the tree grower is relatively simple. Buyers do not have a specific requirement and did not seek more complex output and service from the tree growers. Thus, tree growers were confined to production activities alone such as seedling production, planting, weeding and hoeing and thinning. Therefore, the complexity of the interfirm knowledge for the value chain of *Eucalyptus* pole and fuelwood from Chefasine kebele is relatively simple as compared with other products.

**Potential of codifying transaction/information:** Middlemen and Tulla pole wholesalers and retailers have market information on product demand and price and thus it is relatively straightforward to them to communicate this to tree growers. All the transactions were done by negotiation. For example, consumers buy *Eucalyptus* products from wholesalers, if they do not find the type of a product they want from one actor or they do not agree with the price they go to another actor, do all the transactions and leave. This type of relationship was observed when consumers were buying both semi-processed poles from

wholesalers and retailers. Middlemen sale *Eucalyptus* products, for those who provide a better price. They do all the transactions including negotiation on price and quantity. Once they agree on the price, wholesalers buy the product and the relationship ends there. It is also the same when middlemen and wholesalers want to buy the woodlots from the tree growers. They negotiate until they agree on the price of the woodlots. The key informant interviews of the tree growers and traders assured that trust is lacking in between and among tree growers and traders as well as with customers. Because, there were not any contractual arrangements in between the value chain agents. Lack of contractual agreement indicates the low level of coordination from the buyers in terms of product specification and price determination. The exchange between the actors is straightforward. They specify quantity and price in cash. There is no advanced payment due to the lack of trust in between actors. Thus, considering the above explanation, the potentiality to codify transaction for the value chain of *Eucalyptus* pole and fuelwood from Chefasine kebele is high.

**Capability of suppliers:** The key factors determining whether a tree grower can meet the requirements of a buyer are their access to the land and inputs such as financial capital and seedlings. Tree growers in the study area have a land tenure right to grow *Eucalyptus.* They raise seedlings by their own for their planation establishment. *Eucalyptus* planting is also financially cheaper to invest as compared to other crops (fig. 26). Therefore, tree growers can grow *Eucalyptus* with little support in terms of inputs from the buyers. Thus, the capability of suppliers to grower *Eucalyptus* and provide to buyers as stumpage is relatively high**.**

Table 23. Market value chain governance of *Eucalyptus* pole and fuelwood value chain from Chefasine

| Transaction complexity | Potentiality of codifying transaction | Capability of suppliers | Degree of explicit coordination and power asymmetry | *Eucalyptus* poles and fuelwood middlemen and wholesalers and retailers |
|---|---|---|---|---|
| | | | | ↓ |
| Low | High | High | Low | Market value chain |

SOURCES, AUTOR ANALYSIS BASED ON GEREFFI ET AL. (2005).

Generally, transactions between tree growers and buyers are easily codified, product specifications are relatively simple, and tree growers have the capability to grow *Eucalyptus* with little input from buyers. This type of relationship between supplier and buyer indicates a low degree of explicit ties and power asymmetry. As a result, regarding the Gereffi typology of governance, the value chain of *Eucalyptus* pole and fuelwood originating from Chefasine kebele, Sidama zone, can be portrayed to be market as illustrated in Table 23.

## 4.12 Options for upgrading and improving the value chain

### 4.12.1 Constraints and challenges of tree growers

Tree growers have faced many problems on the course of their *Eucalyptus* production. Land shortage was the primary challenge (28.14%) for their *Eucalyptus* expansion. Almost all tree growers (96%) obtained their land from their families. It can be noticed that no one is interested in selling or renting land for *Eucalyptus* plantation. The occurrence of disease was the second mentioned constraint and challenge for tree production (15.15%) followed by lack of market information (12.12%), road access (11.40%) and transport (9.96%). In addition, financial problem, woodlot competition with other projects, problem of *Eucalyptus* (absorption of more water and reduction of productivity of land around *Eucalyptus*), shortage of seed and seedling availability, as well as difficulty of changing *Eucalyptus* stand to other crops were the constraints and challenges of tree growers in the study area (fig.30).

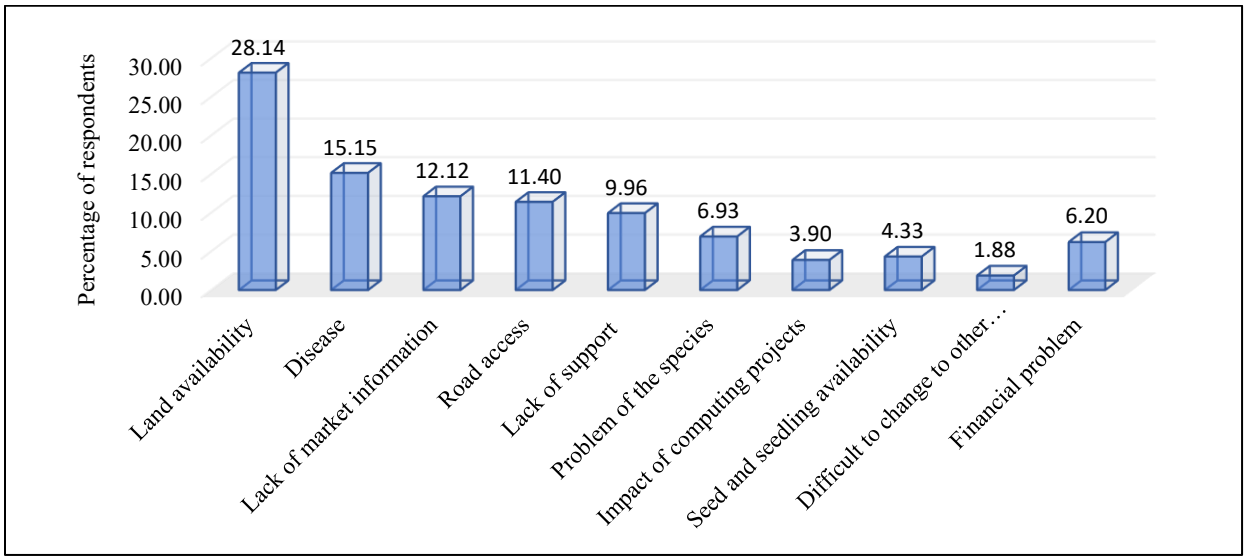



FIGURE 30. PROBLEMS AND CHALLENGES TO TREE GROWERS FOR THE PRODUCTION OF *EUCALYPTUS*.

### 4.12.2 Constraints and challenges of traders

Traders (middlemen, wholesalers and retailers of poles and fuelwood and transporters) have faced different problems and difficulties during their *Eucalyptus* business. The results from the interviewed respondents revealed that 35% of the challenges and constraints were related to the lack of storage area, 24% to the shortage of capital and 10% to the lack of road access. Their business was also constrained by the absences of government support (e.g., training, providing fixed marketing places) (10%), administrative problems such as long bureaucracy (7%) and lack of access to credit (7%). A small proportion (7%) of the interviewers did not have constraints and challenges (fig. 31).

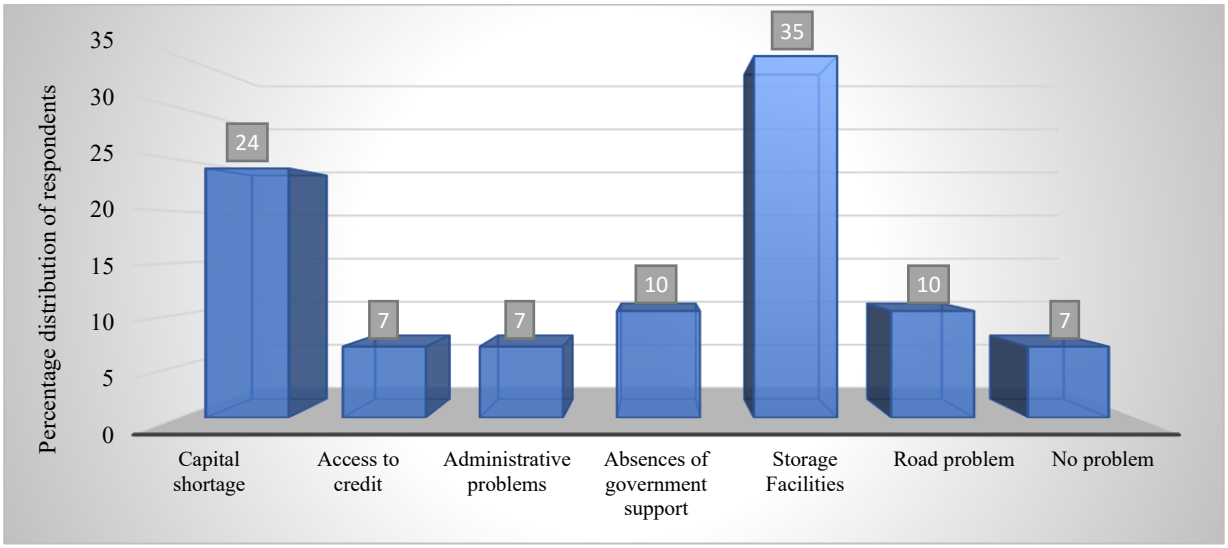



FIGURE 31. PROBLEMS AND CHALLENGES OF TRADERS FOR *EUCALYPTUS* MARKETING.

### 4.12.3 Problems, challenges and constraints identified through PIP workshop at Hawassa

The result from PIP workshop discussion for problems, challenges, and constraints of tree growers and traders (middlemen, wholesalers and retailers, transporters etc) were summarised in Figure 32. All of the problems, challenges and constraints mentioned, were categorized into five main groups. These are: 1) *Eucalyptus* production and competition with other farming 2) harvesting technology 3) transport and road access 4) market information and 5) marketing place/area. The grouped problems and challenges were then prioritised following participants selection and later on ranked (Table 24).

Table 24. Grouped problems and challenges ranked by the participants

| No. | Problems and challenges | Points that participant was given | Rank |
|---|---|---|---|
| 1 | *Eucalyptus* production and competitions with other farming | 2 | 4th |
| 2 | Harvesting technology | 4 | 3rd |
| 3 | Transport and road access | 9 | 1st |
| 4 | Market information | 6 | 2nd |
| 5 | Marketing area | 4 | 3rd |

Problems related to transport and road access were ranked first, indicating the major problems and challenges that constrain the production and marketing of *Eucalyptus* for tree growers and traders in the study area. Lack of market information for the tree growers was ranked as the second problem of the actors. Lack of harvesting technology and area for marketing *Eucalyptus* products was ranked the third. Lack of harvesting technology and area for marketing were the common problem of middlemen, transporters, and

wholesalers and retailers of *Eucalyptus* poles and fuelwood. The fourth ranked problem and challenges were related to *Eucalyptus* production and its associated effect on other crops.

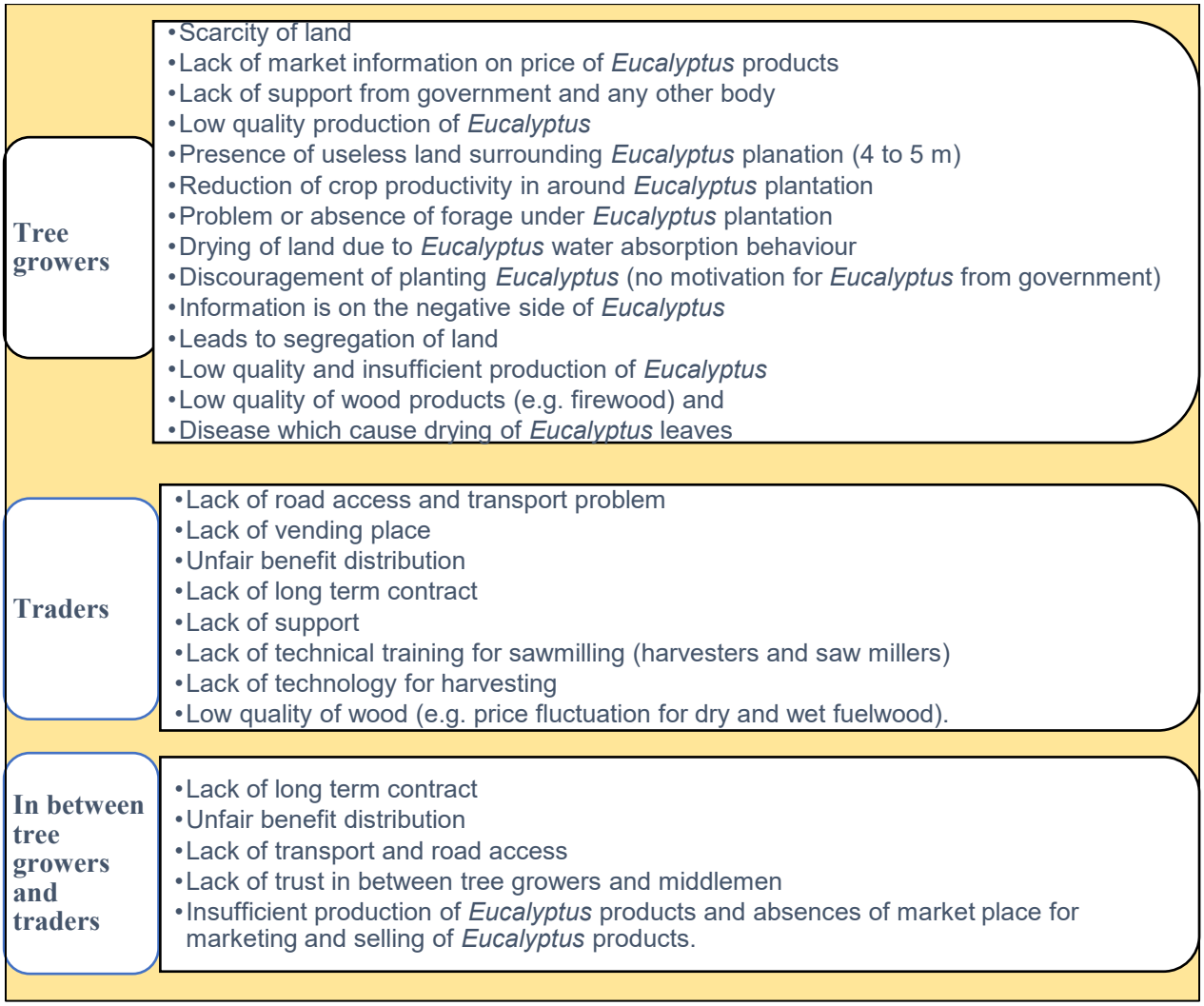



FIGURE 32. PROBLEMS AND CHALLENGES OF TREE GROWERS AND TRADERS (SOURCES: PIP 2018).

### 4.12.4 Option to upgrade the chain from the PIP workshop

Solutions for the identified problems and challenges for improvement of the value chain of *Eucalyptus* pole and fuelwood along the chain were discussed and identified with the participants. The solution for the identified problems and challenges were summarised in Table 25.

Table 25. Solution for the identified problems to upgrade the chain.

| Suggested solutions | Remark |
|---|---|
| Access to credit | To tree growers and traders<br>From government, NGO's etc. |
| Developing a standard system for *Eucalyptus* products | A standard like other crops, for marketing (different products types by using criterion for example length, diameter and quality) |
| Record keeping | Recording day to day activities, the associated costs and revenues. |
| Cooperative for selling and marketing | Organising in the group to sell *Eucalyptus* products, reduced transaction cost; Tree growers |
| Media for information dissemination | Information dissemination marketing and production of products through radios, televisions, and even Facebooks (done by the government) |
| A permanent marketplace for traders and tree growers: | Organise in groups like cooperatives and ask the government for the permanent marketplace and/or buy or rent plots of land from individuals or municipality |
| Institution (regulating and supporting) for planting and marketing of *Eucalyptus* | Rules for planting and marketing (e.g. where to plant), supported by training and provision of seedlings |
| Land segregation or specialization and mass production | Identification of areas for *Eucalyptus* planting with the help of forestry expertise and specialised areas for different products (e. g for different pole types, fuelwood, split wood etc) |
| Planting *Eucalyptus* in proper spacing | Using recommended spacing for the intended products (for different types of poles, fuelwood and others) |
| Product warehousing | Constructing product warehousing for storage (traders). Helps to avoid product deterioration and damage particularly for wholesalers in case of less demand for products (e.g. summer season). |
| Training for development agents and tree growers | Training on production, harvesting and processing of *Eucalyptus* (harvesting and processing machines) |
| Product diversification | Production of briquette and cement boards from residuals (leaves, branches, barks, sawdust etc) to diversify products from *Eucalyptus* |
| Gravel road construction from plantation to the main road. | Organising and asking the government for gravel road construction. |

Sources: PIP workshop (2018)

### 4.12.5 The role of cooperatives in upgrading the chain

According to the International Cooperative Alliance definition, a co-operative is an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise (Zeulie and Cropp 2004). In the study area, there are no cooperative groups for *Eucalyptus* production or marketing as for other crops. Tree growers were not selling their products in the towns, due to the limited market information, lack of knowlegde, trading licenses, marketing place, shortage of capital and others.

A tree grower, Mr. Samuel Sermiso stated that "*we have an association for other crops, but we do not have for Eucalyptus. We do not have support from the government. No one trained us on how to manage and sell our Eucalyptus stand. We do not have available credit institutions so that we are enforced to sell our stand at the lower price when we need money. In my opinion, we would be profitable if we organised into groups and helped each other. However, the challenge here in our village is that we do not have free land for Eucalyptus plantation. Organising in groups for marketing will make us become performed well in the market*". The geographic location of the village (near to Tulla and Hawassa town), the increasing demand of *Eucalyptus* products, the establishment of the new Ministry of Environment, Forest and Climate Change at Hawassa are the some of the opportunities to cooperate.

The result from the value chain governance and commercialisation margin also confirmed that tree growers in Chefasine have relatively little power or influence on middlemen and wholesalers and retailers that purchase their *Eucalyptus* products. Therefore cooperatives for marketing of their products can help tree growers to have market power and improve their marketing share. The marketing cooperative established would be a business organisation owned by tree growers to sell their products collectively. It allows the tree growers to accomplish functions together that they could not achieve on their own. Joining with other tree growers in a cooperative can give them greater power in the marketplace. Also, cooperatives can provide tree growers more control over their products as they make their way to consumers by allowing them to bypass the middlemen in the market channel and capture more of the returns that may otherwise go to the others actors. Additionally, cooperatives would bring the tree growers one step closer to the final consumer with their products, and both of them will be eventually benefited (Islam et al. 2014).

The idea was also supported from the PIP workshop carried out at Hawassa that, cooperative can help the tree growers to benefit from their woodlot through the reduction of the cost of transactions and increase efficiency as well as improvement of production and market information. Having market information rises their negotiation power and which can make them equally benefit in the business. Besides, cooperative can help tree growers to get access for market information, credit as well as training from both government and other stakeholders to improve their position and benefit in the chain.

# CHAPTER FIVE

# 5 DISCUSSION

## 5.1 Discussion of Methodology

This research study was focused on a case study of the value chain of *Eucalyptus* poles and fuelwood based in Chefasine kebele, Hawassa Zuria District in Ethiopia. The study used both quantitative and qualitative research methods. The focus on case study as a research method in this research was because of the concern of the limitation of quantitative methods in providing holistic and in-depth explanations of the social and behavioural problems. For example, on issues like actor's coordination, linkage, mechanisms of actors and control and maintain access from the resource, how the system of the value chain works as well as the constraints, challenges of actors along *Eucalyptus* value chain. Through case study methods, the researcher was able to go beyond the quantitative statistical results and understand the behavioural conditions through the actor's perspective. Majority of development studies utilise qualitative approach due to the complexity of the issues (e.g. Ponte 2001; Abtew 2012). Abtew (2012) used a case study approach to analyse the commodity chain of frankincense from the dry woodlands of the Nuba Mountains, South Kordofan State of Sudan.

According to Ryan (1995), several useful questions, for example, does the sampling frame represent the population? Would be raised concerning the process of sampling. In this study, a total of 150 active woodlot growers were identified from Chefasine kebele. From these, 20 tree growers (30%) were used for the collection of the primary data. Abtew et al. (2012), has used 30 interviews and triangulated to make sure the reliability and validity of the data. The samples used in this study was representative to the kebele level, and moreover, different data collection methods including key informant interview, market assessment, direct observation, participatory innovative platform, and focus group discussion were applied to make sure the validly and reliability of the collected data. The participatory innovative platform is an innovative way of problem-solving approach and important tool for the actors to know each other, discuss openly on their problems and solution for the problems. The opened discussion helps actors to gain a significant change on their knowhow, improve their interconnectedness and trust.

However, the method lacks generalisation for the total region or Sidama zone. Although the study area has been involved in *Eucalyptus* production, management and marketing, it was observed that Shebedino District has much more potential for *Eucalyptus* plantation and marketing; this is attributed to its geographic location; as the main road passes through this District, availability of land and attitude towards *Eucalyptus* business.

Information on woodlot data of height and diameter at breast height (DBH) were taken from Thiem (2018). In this study area, 20 *Eucalyptus* stands from nine boundaries, and eleven woodlots were used to

collect height and (DBH) measurement (Thiem 2018). For these study measurements only from the woodlots were used to analyse the relationship between growth (volume) with age for different rotations. It means the analysis was done solely from eight sampled *Eucalyptus* woodlots and which may not be representative for the whole stand.

## 5.2 General discussion of results

*Eucalyptus* is grown by many smallholder farmers in Ethiopia mainly for the production of fuelwood, charcoal, construction wood, poles and furniture making. According to Mekonnen et al. (2007) and Hailemicael (2012), poles, fuelwood, branches, roots and leaves are common products of *Eucalyptus*. In the study area, Chefasine kebele, *Eucalyptus* pole, fuelwood, splitted poles, branches including (leaves and twigs) and seeds were the products of *Eucalyptus*. Poles, splitted poles and fuelwood were the current marketable products in the study area. Marketing of branches including leaves, twigs, and seeds was not common in Chefasine. However, in other parts of Ethiopia, for instance, in the towns of Sendafa and Sululta, around Addis Ababa city (Chiche and Kelemu, 2010), one bundle of *Eucalyptus* leaves and branches with an estimated weight of 30 kg were sold at 50 ETB (US $ 1.84). Similarly, marketing of E*ucalyptus* branches for firewood and fencing was a common practice in Wogera Districts of North Ethiopia (Betelhem 2017). Of all products, *Eucalyptus* poles were the main core marketable products in the study area. Some reasons to account for this are: 1) the multiple purposes of poles or unmet demand for *Eucalyptus* poles owing to the thriving construction industry both locally and regionally and 2) the majority, that is about 70% of the woodlots sold in the area were five and fewer rotation periods, which means, are not profitable if sold as splitted poles or fuelwood due to their smaller size. Besides, lack of substitution of *Eucalyptus* poles for construction materials is the reason for the high demand of *Eucalyptus* poles. This finding was congruent with the finding of Betelhem (2017) that, among the *Eucalyptus* products*, Eucalyptus poles* (Mager and Weraj) had the highest contribution to wood supply to the market by volume from smallholder farmers in Wogera District of Northern Ethiopia. The price given to a single pole of *Eucalyptus* was different in different places, for instance, the average price recorded by Betelehem (2017) for a single pole was 2 times (26 ETB) more than the price given in the current finding (13 ETB).

Products of *Eucalyptus* has been assorted in different types depending on the length, quality and diameter of the products. Betelhem (2017) identified five types of *Eucalyptus* product assortments in Wogera District, Northern Ethiopia. These included: Woraje, Mager, Kirsti, Yebet filt, and fire wood. In this study, 10 different types of assortments were recorded (see Table 8). Almost similar assortments were observed by Hailemicael (2012) in Sendafa town, Central Ethiopia. In the study area, poles that are straight and has 12 to 14cm base diameter and 7 to 15m length were assorted as Teshegagari, large poles used to fix two sides of the roof) while, poles that have 1 to 2cm base diameter and 3 to 5m length were assorted as

Chefeka, applied for small traditional cottage building. Smallholders have used different marketing line to deliver their product in to the market, based on a smallholder's access to trader and trader contact to smallholders. Betelhem (2017) had identified seven marketing lines for *Eucalyptus* marketing from Wogera District of Northern Ethiopia. Likewise, this study found seven different marketing lines for poles while four different lines for fuelwood. Of these lines, two lines (from Chefasine to Tulla: Line 1 and from Chefasine to Hawassa: Line 2) for pole and one line (tree growers to middlemen to large fuelwood wholesalers and retailers to small fuelwood retailers to consumers) for fuelwood were found to be the main marketing lines of *Eucalyptus* from Chefasine.

*Eucalyptus* business is financially profitable for all actors (Table 10 and 11). However, the benefit distribution showed an increasing distribution from the tree growers to wholesalers and retailers (see Figure 18) except for fuelwood (see Figure 19). Studies conducted by Abtew et al. (2012) on the commodity chain of frankincense, and Tahir et al. (2015) on marketable natural products showed an analogous situation of upward benefit distribution as the value chain moves from producer to wholesaler and retailer. In contrary to this, the finding of Betelhem (2017), on *Eucalyptus* value chain, showed the increasing share of the benefit distribution to the producers. It might be due to the difference in value addition and processing activities done by the producers. Tree growers in Wogera District of Northern Ethiopia, do functional activities including land preparation, nursery seedlings production, planting, fencing, weeding, harvesting (cutting) and post-harvest handling as well as marketing (Betelhem 2017). While, most of these functional activities such as harvesting, post harvesting and marketing activities were not carried out by the tree growers of Chefasine, basically due to the lack of market information, knowledge, licence for trading, and technical support.

In the case of fuelwood, the higher margin was recorded at the middlemen level due to the lower cost of *Eucalyptus* from the stand. The large fuelwood wholesalers and retailers and small fuelwood retailers reap lower margin as compared to the middlemen. For poles, the incurred expenses and value added are almost proportionally related among the actor's levels as indicated in Table 12 and Table 14, respectively meaning that proportional distribution of input and output by actor's segments. For fuelwood, the expense and value-added had not proportionally related as the middlemen have high value-added with lower cost. While, fuelwood wholesalers and retailers incurred a high cost but created low value (see Figure 23). The price of *Eucalyptus* poles at each actor level is very high as compared to the other actor's inputs. The product (poles) cost accounts almost 86%, 81% and 98% for Tulla pole wholesalers and retailers, middlemen and Hawassa pole wholesalers and retailers, respectively. For fuelwood, it accounts for 27%, 98% and 98% for middlemen, large fuelwood wholesalers and retailers and small fuelwood retailers, respectively. The largest proportion of the value was created by middlemen and pole wholesalers and retailers of Tulla as profit (See and Figure 20). The percentage distributed for labourer as wage and government in form of tax and fees accounted very small. This finding was not inline with the finding of Betelhem (2017). According to

Betelhem, from the total value created, 53% of the value added goes to the tree growers as profit, 12% to the wage and 15 government in the form of tax and duties.

The annual commercialization margin, for the middlemen and Tulla and Hawassa pole and fuelwood wholesalers and retailers were exceptionally high as they deal with a large quantity even in a short time. However, tree growers, as opposed to traders had to wait for at least five years of rotation (average rotation period) for the commercial utilisation of *Eucalyptus* and thus received lower margin. The distribution of the commercialization margin for the value chain of *Eucalyptus* pole and fuelwood in Chefasine supports the frequent claim of unfair and excessive margins captured by middlemen at local markets in developing countries (Poudel et al. 2009; Chakma 2011; Abtew et al. 2012; Sanga 2016). However, it was contrary to the finding of Betelhem (2017), that smallholder producers, in Wogera District of Northern Ethiopia, received higher margin than trader from the sale of *Eucalyptus* products. Betelhem, further investigated, the continuous improvement of woodlot price due to the increasing number of traders and the demand for wood products. In the current study, only three middlemen were recorded, which might create low competition between traders and give the privilege to have high bargaining power on the price of the *Eucalyptus* stand. Moreover, this can be elucidated by the fact that tree growers perform a limited range of functions in the value chain, only the supply of stumpage *Eucalyptus*, while traders held the functions (harvesting, transporting, marketing) that significantly increased the value of the product, which was not the case for Wogera tree growers (Betelhem 2017).

Although tree growers have captured low benefit as compared to traders, however, *Eucalyptus* business is their second important livelihood option next to home-based agroforestry practice (HAF's) (Shibire 2017). In the past years, the intention for the management of the woodlots was for household consumption such as construction and firewood and was mainly planted in roads sides, marginal lands and farmland boundaries. However, currently, the management intention is changed to market-oriented due to primarily the price rise of the *Eucalyptus* products and extensively planted as a woodlot on poor and unproductive areas of coffee and khat farmlands. Similarly, in many parts of Ethiopia, farmers purposely planted *Eucalyptus* mainly for economic and social services on degraded and erosion-prone grounds (Mekonnen 2007; Hailemicael 2012; Zerga and Woldetsadik 2016).

According to Zerga and Woldetsadik (2016), *Eucalyptus* production, in Eza woreda of Guraga zone, was the second important source of income next to enset. Similarly, a study by Asaye (2002) indicated, a high financial return from *Eucalyptus* as compared to the commonly grown and planted crops of *teff* and sorghum in Gonder Zuria District of north-western Amhara. Consistently, in the current finding, the income contribution of *Eucalyptus* (US $ 1,489) (35%) was ranked secondly following Home-based Agroforestry practice (HAF's) (US $ 2,331 (56%). But, the contribution outweighs the other livelihood portfolios of kaht (US $ 1,211), coffee (US $ 1,008), enset (US $ 55) and others, when compared separately. Moreover, woodlots in the study area have been used for shading, fencing, making of farming equipment's, shelter or

windbreak, reduce deforestation, as s form of saving, seed production as well as for bonfire (Meskel celebration). Most of these functions were in line with the finding of Asaye 2002; Mekonnen 2007; Zerga and Woldetsadik 2016; Gizachew 2017).

Value chain of different forest products has been constrained by various factors and limits the benefit sharing of actors, especially the smallholders of producers. According to Abetw et al. (2012), lack of awareness, limited financial resources and capital, and market knowledge about quality requirements for the commercial chain of Frankincense had limited the capability of producers to add value in the form of primary processing. Poudel et al. (2009) confirmed, the limited development of Non-Timber Forest Products (NTFP's) sector of Nepal due to the presence of different barriers including, inadequate knowledge and skill in modern technology, insufficient finance and lack of sufficient information. Besides, the economic and institutional barriers such as: transportation costs, quality standards, inadequate and uncoordinated market information systems to wattle marketing had limited the wattle-sector development of Njombe and Lushoto Districts of Tanzania (Sanga 2016). Similarly, the current finding confirmed, that lack of access to market information, finance, road (from the production area to the main road), storage space, capital, support from the government and NGO's (e.g., technical on silviculture and financial, through arrangements of the credit institutions) as well as lack of license and cooperation in between actors hindered the growth of the sector of *Eucalyptus* production and marketing in the study area. There has also been inadequate knowledge and skill with the tree growers and traders about modern technology (e.g. harvesting and product development). On the other side, the technical support given for producers through extension services, credit arrangement, training as well as provision of market information and trade license on *Eucalyptus* production and marketing at Wogera District of Northern Ethiopia (Betelhem 2017), has played a great contribution for the development of the sector through the improvement profit for both actors, wages of laboure's and revenue of the government.

As it was observed in Figure 30, the value chain of *Eucalyptus* pole and fuelwood were characterised by market governance types. The complexity of *Eucalyptus* products is very low as compared to other products, and no processing occurs at the tree growers' level. This finding is in line with Gereffi et al. (2005) who postulated the prediction of governance structure in value chains. Such types of value chain governance were identified in the value chain of the teak pole from Benin and non-timber forest products value chains in Bangladesh (Velde et al. 2006; Aoudji 2012). To market agricultural products in developing countries, the structure of the network is often seen as a key coordination form (Hoffmann and Bernhard 2007; Aoudji 2012), however, this has not been the same for the *Eucalyptus* growers at Chefasine kebele. Moreover, the support services from the government and NGO's for the development of *Eucalyptus* production and management was very little.

## 5.3 Upgrading options

Despite these limitations, several options to improve the value chain analysis of *Eucalyptus* products in Chefasine Kebele exist. Here are some of the intervention options identified for the healthy growth of *Eucalyptus* pole and fuelwood value chain (fig. 33). Such intervention options were developed from the in-depth interview, key informant interview, focus group desiccation and participatory innovative platform.

### A. Creation of tree growers cooperatives

In the study area tree growers did not have any form of cooperation for *Eucalyptus* prodcution and marketing. The creation of tree grower cooperatives for the improvement of marketing information and sharing is a crucial intervention area for tree growers that suffer from inadequate knowledge and information on marketing and prices of the *Eucalyptus* proudtcs. These cooperatives can significantly reduce intermediaries from network structure and also integrating tree growers horizontally to acquire the right power (Trienekens 2011) over powerful middlemen and wholesalers and retailers, who dominate and control the price of *Eucalyptus* poles and fuelwood. As suggested by Aoudji et al. (2012), adopting the system whereby few experienced individuals, e.g., cooperatives may transport the products belonging to several stakeholders in the market is the better option to reduce the transaction cost and improve market information. Cooperatives can facilitate price informmation contacts with wholsailers and retailer in main market town centers throgh the coopratives leaders. Tree cooperative enhances the value-added processing activities such as harvesting, splitting, debranching and piling at the tree growers level, this, in turn, helps tree growers to increase their benefit sharing from the final consumer price and to improve their livelihood activities and enable them to retain more profits at the community level (Trienekens 2011). The idea from the Trienekens was also supported in the case of Wogera tree growers, where they receice more profit (Betelhem 2017) from the final consumer price and improve thier livelihood. In Wogera Distrcit of Northern Ethiopia, different informal and formal types of cooperatives, which are working on *Eucalyptus* prodcution were identified. These are, informal (Dabeyet and Mahabir/Senbete and formal (Farmers' Development Group and Farmers' Cooperative) (Abebe 2017).

### B. Arranging access to credit

Arranging credit access to tree growers enabled them to produce and sell their products themselves at the right time of rotation and hence improve their income. Due to the financial survecie provided for tree growers in Wogera District (Betelhem 2017), tree growers have developed high negotiation power and wait until they got an affordable price for their woodlots.

**C. Acces to extenstion service and training**

The currently avilable extenstionists in the village are not forest experts and their foucs was on agricltural aspects including: soil improvemnet and water conservation. So specific knowledge on tree planting, spacing detremination, tree species selection, objective based planating, when and how to harvest, selection thinning and marketing was lacking similar to the finding by Hingi (2018). in Tanzania. Thus, access to extenstion and technical training is important to improve the performance of the woodlots interms of growth and productivity. Training on tree planting, good access to market and roads, and provision of seedlings in Gonder Zuria District of northwestern Amhara, motivated tree growers to plant and extend *Eucalyptus* woodlots (Asaye 2002). Similarly, Betelhem (2017) reported that tree growers who had access to extension services, training, and trade license gained higher returns. Moreover, it enables them to get a fair price for their products during marketing time. In this option, the formation of cooperatives would play a crucial role due to the assumption that farmer associations or cooperatives can attract support from organizations. For example, according to Hingi (2018), in Tanzania; tree growers who have better tree planting, management and product marketing skills were those who belonged to the tree grower associations (TGA's), and this was attributed to the training, material and funding they received from support organisations. Here, the newly established ministry of Environment, Forest and Climate Change has played a big role by devolving power to the lower level, employing forestry expertise, giving training and providing improved seeds and planting materials.

**D. Facilitating road and transport access**

Enabling of road and transport facilities in the study area will increase the supply of *Eucalyptus* products to the market by tree growers themselves and help them to increase their yearly income. It also helps the buyers to get easy accessibility to the area and reduce their transportation costs and increase the price of the tree growers stand.

**E. Formulation and enforcing of policies**

Formulation of government polices that encorages and supports tree growers tree production and marketing is important for the improvmnet of the value chain of *Eucalyptus* in the study area. Encoraging policies may consist of, for example, providing free and improved seeds and seedlings, allwoing tax free investments, standarsing the products, licence for the tree growers. Enforcing rules and requlation that are alaredy on the paper are also crucial for the developmnet of the sectors. Currently, *Eucalyptus* is planted in areas that are believed to be not productive for khat and coffee without following the government rules and regulations.

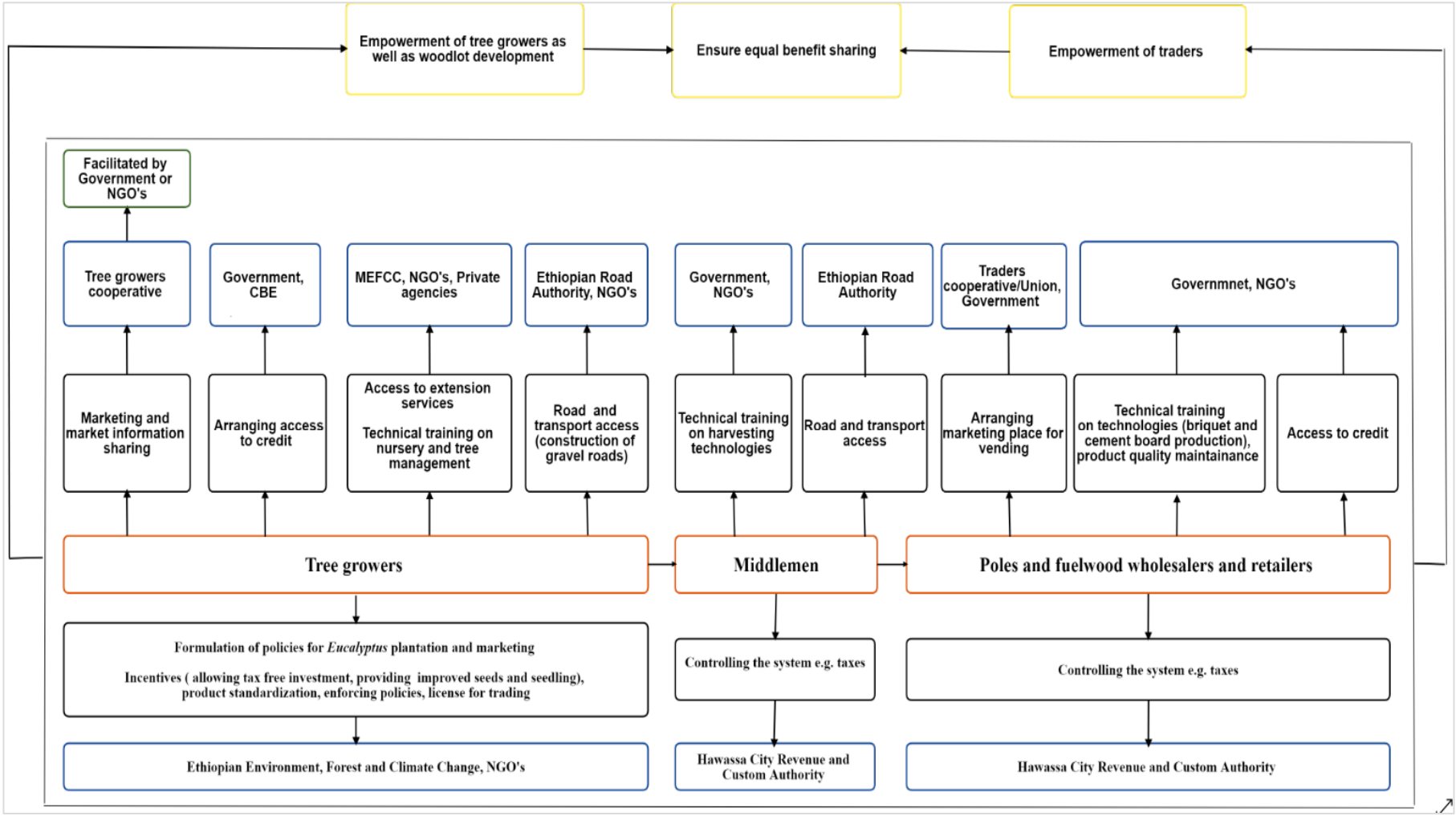



FIGURE 33. INTERVENTIONS OPTIONS FOR THE UPGRADING OF *EUCALYPTUS* POLE AND FUELWOOD VALUE CHAIN DEVELOPED FROM THE INTERVIEW AND PIP WORKSHOP

However, there is a need to recognise, that the downstream actors bear relatively higher levels of risk due to capital investment and market fluctuation, as the tree growers are supported. For example, the income that the tree growers grasped will increase at least with the amount equal to the processing cost of traders (middlemen and Tulla pole wholesalers and retailers). While, the income for the middlemen and wholesalers and retailers will be reduced, and the business for the middlemen will be at risk, as the tree growers will take over most of the value processing activities. Thus, intervention on the downstream actors (traders) is also required.

### F. Upgrading options of traders

Access to marketing area, credit, road, and techenical traning on techenologies were some of the options identified for the improving of the value chain of *Eucalyptus* at the traders level. The main problem of middlemen and pole and fuelwood wholesalers and retailers was lack of definite storage space or marketing area for storing and vending *Eucalyptus* products. They used the road sides for vending the products. In addition, it was observed that wholesalers and retailers lack knowledge on quality control of the products. Innovation technologies on harvesting and product development were not available. Also, credit access was limited for them and road and transport access was lacking. Therefore, dealing with this challenge helps the trader to improve their business. To solve the problem of marketing area, creating traders cooperatives or union is essential. Trader cooperative helps traders to ask land from the governmnet or buying/renting land from the munucipality or private agencies. Technical training on technologies for example, on harvesting and product development like briquettes and cement board production as well as quality control, helps traders to improve the value-added processing activities and add value to the product and therefore increase their revenues. Interventions such as controlling the system (organising labourers and proper collection of tax) bring equitable share for the labourers and the government. It, in turn, improves the value of *Eucalyptus* for the development of the village as well as the nations. The intervention options empowered tree growers, as well as traders and ensured equal benefit sharing from *Eucalyptus* products. Creating a common platform for disccution such as a particicpatory innovative platform is essential to ensure the benefits access of diffrent actors. The partcicpatory innovative platform helps actors to know each other, disscuss thier problems and find a common solution for thier problem. In general, all the problems and challenges faced by different actor groups cannot be addressed by a single organization, various actors: including government (research institutions mainly, Ministry of Environment, Forest and Climate Change, credit institutions, decision makers etc.), individual actors, NGO's and other private organizations need to have collaborated in search of appropriate solutions and implementation.

# CHAPTER SIX

# 6 CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Conclusion

This study was carried with the main intension to analyse the value chain and identify options for *Eucalyptus* pole and fuelwood originating from Chefasine kebele, Hawassa Zuria District, Southern Ethiopia. Growing *Eucalyptus* is quite profitable as compared with other farming systems; hence it should be encouraged to alleviate the wood product supply crises in the country. Woodlot management is one of the livelihood options for many of the farmers in Chefasine kebele. Tree growers in Chefasine were started planting *Eucalyptus* before 20 years. Currently, *Eucalyptus* has been planted for income generation, but at the same time, it contributed a lot for the conservation of degraded land, the supply of pole for construction, firewood, shading, saving and others.

Moreover, the income from *Eucalyptus* was mostly used for the payment of education fees and house renting, to purchase household consumptions good (food, cloth, equipment) and others. Poles, fuelwood, splitted poles, seeds, branches and twigs are products of *Eucalyptus* from Chefasine. Among this, *Eucalyptus* poles were the most traded products (85%), sold at Tulla and Hawassa towns followed by fuelwood (5%), sold mostly at Tulla towns. Two main lines from Chefasine to Tulla (line 1) and from Chefasine to Hawassa (line 2) for pole and one line (Tree grower till small fuelwood retailers) for fuelwood were identified. The value chain of *Eucalyptus* poles and fuelwood originated from Chefasine Kebele has four main functions including production, processing, marketing and consuming. These segments were undertaken in sequential order by tree growers, middlemen and Tulla pole wholesalers and retailers, Hawassa pole wholesalers and retailers and consumers.

*Eucalyptus* production and marketing were financially profitable for producers, middlemen, Tulla and Hawassa wholesalers and retailers of the pole and middlemen of fuelwood. However, the benefit distribution was vertically skewed for poles, implied that *Eucalyptus* tree growers received less income in spite of their efforts and role in the production of *Eucalyptus*. The share of middlemen was high in case of fuelwood value chain as compared to the other actors. The commercialisation margin shows increasing distribution towards the downstream actors for pole while for fuelwood, middlemen have received high commercialisation margin (74%) than large fuelwood wholesalers and small fuelwood retailers (8% and 12%), respectively. Tree growers received a commercialisation margin of 6% from fuelwood. The annual reaping of tree growers was considerably smaller compared to the downstream actors. Tree growers have to wait five years, while the downstream actors deal with large quantities of *Eucalyptus* products in a short period and gain a large share of benefits.

The value chain actors used different mechanisms to get access and control over the *Eucalyptus* products and obtain benefit from the business of *Eucalyptus* pole and fuelwood. These mechanisms include: access to market information, capital, finance, labour opportunities, relationship buildings, license and vending area among others. Market government type was identified along the chain. Supporting services for the tree growers and traders was minimal. Tree growers had received lower profit and as compared with traders. However, it known that, under the present condition, the downstream actors have a higher level of costs for both pole and fuelwood except the middlemen in fuelwood. Value addition as the primary processing at the tree grower level is low due to lack of capital, lack of knowledge and market information, license and vending area among others. Improving the processing activity at the tree growers' level would be a high potential for increasing the benefits of the tree growers. For example, if the tree growers were organised as cooperatives for selling and market information sharing or were able to find support like, access to extension services, credit facilities and training for their plantation, their income would be increased tremendously.

However, when the tree growers are supported, it is known that the downstream actors bear relatively higher levels of risk. So that, intervention solution should be devised for the downstream actors as well to bring equal benefit sharing from *Eucalyptus* business. Many such options were developed in figure 34, which can empower both the tree growers and traders and ensured equal benefit sharing. These included the creation of cooperation among tree growers for information sharing and marketing, easiness of access to credit, construction of gravel roads and made transportation facilities available and formulation of encouraging policies and enforcing rules and regulations. Besides, the creation of unions for traders for the purchase or rent of marketing area, improving road access, facilitate credit mechanism, development of technologies for harvesting and processing of *Eucalyptus* products in to, for example, briquettes, chopped woods, etc. as well as improving tax controlling system were the suggested options for upgrading. In general, individual actor (tree growers, traders etc.), governmental and other non-governmental agency have to be work together to enhance the value of *Eucalyptus* and the livelihood of the community as well as to improve the contribution of *Eucalyptus* for both regional and national development.

## 6.2 Recommendation

Based on the findings of this study the following are some of the recommendations suggested for the future improvement of the value chain of *Eucalyptus* from Chefasine kebele.

**1.** The current management system of *Eucalyptus* in Chefasine kebele is based mostly on experience, where main basic silvicultural systems including soil management, thinning, and spacing among others are lacking. Well organised nursery mainly for *Eucalyptus* production does not exist. Tree growers mostly used bare-rooted seedlings raised on not well-established seedbeds. *Eucalyptus* planation does

not follow appropriate planting spacing and is not objective specific. Most of the tree growers do not know the importance of thinning and therefore the majority of them do not thin their woodlots. Soil management (soil loosing and fertilising) is not a common practice after the first planting. However, all these management systems are required to improve the productivity of the woodlots and ensure sustainable wood production and supply. Thus, this research recommends that the concerning body especially the new Ministry of Environment, Forest and Climate Change to help tree growers on these essential silvicultural activities, by employing forest extensions in the area.

2. The current analysis on value addition and its distribution at the tree grower level showed the weak and passive passion of tree growers as compared to other traders. Securing higher benefit and empowerment of tree growers can increase production of the woodlot and secure continuity of the business. Therefore, urgent actions are thought essential to empower the tree growers and secure their livelihood as well as sustainable development of the woodlots.
3. The study also revealed weak horizontal and vertical coordination and relationship in and along the value chain of *Eucalyptus* production and marketing. Thus, mechanisms to assist tree growers (the most affected actors) to organise themselves better and to develop activities jointly (cooperatives) focussing on marketing is essential and cooperatives should be established to improve the price bargaining power and market information of tree growers.
4. Market information for example on price and demand for crops such as coffee, khat, maize etc. is available and provided using television, radios, mobile SMS and other communication means, however, this is not available for *Eucalyptus* production and marketing, therefore, integrating *Eucalyptus* based products in the system is recommended to improve the production and marketing information.
5. The service provision for *Eucalyptus* production and marketing from the government, NGO's and other agents is minimal. Therefore, provision of services including training on silviculture of tree management, processing, marketing as well as technology development to the tree growers and traders, arranging credit facilities, road and transport access etc. are essential for the development of the sector and recommended. Such support might be provided by the government, NGO's or any private agencies and projects like WoodCluster project.
6. Rules and regulation on production and marketing of *Eucalyptus* are minimal. Polices that encourage *Eucalyptus* planting activities do not exist. Also, the value-added distribution to the workers and government are almost negligible. Nevertheless, the currently available regulation is not properly implemented. Therefore, the present study recommends the formulation of appropriate government policies that encourage *Eucalyptus* planting (incentives and subsides) marketing and enforcing rules and regulation (e.g. on Eucalyptus planting and tax collection).

7. Establishment of demonstration site for training or as a filed school on silvicultural practices of tree planting as well as on marketing of the *Eucalyptus* products is believed to empower tree growers and helps to fill the current gaps of skill, knowledge, and information. Thus, the establishment of a demonstration site by the government, NGO's and other projects like WoodCluster project are recommended.
8. The present study does not include the other potential *Eucalyptus* growing and marketing areas in Sidama zone. The study mainly examines the *Eucalyptus* value chain originating from Chefasine kebele. Thus, further studies in analysing the *Eucalyptus* chain considering the whole zone focused on Shebedino, Wondo Genet Woredas and other zones such as Wolaita zone is recommended to give a clear picture of the *Eucalyptus* value chain in the region.
9. *Eucalyptus* leaf wilting disease was observed during data collection and is one of the main concern of tree growers. Therefore, additional and integrated research is sought to identify the disease and find a possible solution.
10. In the study area some products of *Eucalyptus* such as slabs and sawdust are not tradable. Thus, studies are recommended to develop technologies and to add the values of these resources.

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# APPENDICES

**Appendix I: Questionnaires for the in-depth interview, key informant and focus group discussion**

**Introductory note**: The main objective of this questionnaire is to study the value chain and upgrading options of *Eucalyptus* pole and fuelwood in Sidama zone, Hawassa Zuria District, Hawassa. The study is being conducted as part of the MSc. thesis in Tropical Forestry. I am grateful to thank you for your willingness, respect and taking the time to fill this questionnaire'. Information given by you will strictly be kept confidential during the course of the study and beyond.

Name of interviewer……Date of interview …….
Kebele (Village)……. Sub village……No…….

1. **Personal information of the respondent**
   A. Name of the respondent……
   B. Sex of respondent: 1. Male ☐ 2. Female ☐
   C. Age of the respondent……...years
   D. Formal educational level of the respondent: 1. Formal education ☐ 2. Primary education ☐ 3. Secondary education ☐ 4. More that secondary education ☐
   E. Marital status: 1. Single ☐ 2. Married ☐ 3. Widow ☐ 4. Divorced ☐
   F. Number of people in the household…….
2. How many plots of land do you have at present in total? …….
3. What types of land use do you have on your land?
   A. Farmland……. (ha) B. Homestead ……. (ha) C. Grazing land……. (ha) D. Plantation with *Eucalyptus*……(ha) D. Marginal land……. (ha) E. Others……
4. What are the sources of your land?
   A. Rent……. (ha) B Own……...(ha) C. Family ……. (ha)
5. If your land is from rent, how much is the rent?.....(ETB/month/year) and which payment are you used for land rent?
   A. Share B. Cash C. Other:
6. What are your livelihood activities? Please Rank your livelihood activities according to its contribution to your household needs.

| No. | Livelihood activity | Income (ETB) per year or per season | How long have you been involved in this livelihood activity? |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

7. Do you think *Eucalyptus* pole and fuelwood contribute to your livelihood? 1. Yes ☐ 2 = No ☐
   If yes in what way, it supports you? ……...
8. Inputs used and their associated cost for *Eucalyptus*, HAF's and Agriculture?

| Inputs/per season/unit area/hectare | | Livelihood activity | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Woodlot | Coffee | Khat | Enset | Vegetable | Others | Maize | Haricot bean | Others | Cordia | Banana, avocado, gesho | Others |
| Fertilizer | Kg | | | | | | | | | | | | |
| | Cost | | | | | | | | | | | | |
| Pesticide | Liter | | | | | | | | | | | | |
| | Cost | | | | | | | | | | | | |
| Seedling | No. | | | | | | | | | | | | |
| | Cost | | | | | | | | | | | | |
| Seed | Kg | | | | | | | | | | | | |
| | Cost | | | | | | | | | | | | |
| Oxen | No. | | | | | | | | | | | | |
| | Cost | | | | | | | | | | | | |
| Hired labor | Mad day | | | | | | | | | | | | |
| | cost | | | | | | | | | | | | |
| Family labor | Mad day | | | | | | | | | | | | |
| | cost | | | | | | | | | | | | |
| others | Unit | | | | | | | | | | | | |
| | Cost | | | | | | | | | | | | |

9. What are your assets?

| Assets | | Number | Price (on average) | Input cost | | | |
|---|---|---|---|---|---|---|---|
| | | | | Labour | grass | Medicine | others |
| Livestock | Oxen | | | | | | |
| | Cow | | | | | | |
| | Heifer | | | | | | |
| | Others | | | | | | |
| Goat | | | | | | | |
| Sheep | | | | | | | |
| Poultry | | | | | | | |
| Donkey | | | | | | | |
| Horse | | | | | | | |
| Others | | | | | | | |

10. Which family members are engaged in farming mostly.
    A. Bellow 12 years B. 12-18 years C. Above 18 years
11. How long does the family spend working on the farm per day? excluding church and other social activity days…… and how is the household labour distributed for each land use type?

| Months | Required labor hour/day (HAF's) | | | Farming | *Eucalyptus* production | Remark |
|---|---|---|---|---|---|---|
| | Khat | Coffee | Enset | | | |
| September | | | | | | |
| October | | | | | | |
| November | | | | | | |
| December | | | | | | |
| January | | | | | | |
| February | | | | | | |
| March | | | | | | |
| April | | | | | | |
| May | | | | | | |
| June | | | | | | |
| July | | | | | | |
| August | | | | | | |

12. For which activity do you hire labour?
    A. Farming B. Homestead C. *Eucalyptus* planation D. Others
13. How many labourer per production season do you hire for each land use type? What is the labour cost per day or per production year? Is the labour cost differing? Which land use activity is more labour intensive?

| Land use type | No. of labour | Labour cost | Inessive labour | Remark |
|---|---|---|---|---|
| Farming crops | | | | |
| Homestead | | | | |
| Eucalypts | | | | |
| Others | | | | |

Rank 1. More intensive 2. Intensive 3. Less intensive 4. Not intensive

14. Why are you interested in *Eucalyptus* plantation?

| Functions | Remark (Rank) based on importance |
|---|---|
| | |

| | |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |

Rank 1 very important 2. Important 3. Less important 4. Not important.

15. How long have you been planting Eucalyptus?

A. Less than 5 years ☐ B 5-10 years ☐ C. 10-15 years ☐ D. 15-20 years ☐ E More than 20 years ☐

16. What is the trend of *Eucalyptus* woodlot plantation?

A. When you start planting…….(size) ha

B. Currently……ha

C. Future expectation after 5 years ……ha

17. What are the most important products from *Eucalyptus* that you have grown?

| **Product type** | **Proportion** | **Preferences** |
|---|---|---|
| Pole for fencing and construction | | |
| Fuelwood | | |
| Charcoal | | |
| Others | | |

Rank 1. mostly preferred 2. Preferred. 3. Less preferred 4. Not preferred

18. What types of seedlings are used for your *Eucalyptus* woodlot? Which species?

A. Bare rooted ☐ B. Containerised ☐ C. Others specify ☐……...

19. Which are the most preferred types of a seedling from and why?

A. Bare rooted B. Containerised C. Others specify…….

20. Where do you get seedling? 1. In the market ☐ 2. Own production ☐ 3. Others please specify….

21. If from the market how much is the price per seedling?.....ETB

22. Where do you plant *Eucalyptus*? And which one is the most preferer and why?

A. Farmland and homestead ☐ B. Grazing land ☐ C. Marginal land ☐ D. Others specify…….

23. What is the management during the rotation?

| Silvicultural management | Working hours | No. of days | No. of worker | Family labour | Hired labour | Cost per day | Cost per hectare per year/season |
|---|---|---|---|---|---|---|---|
| Site Clearing | | | | | | | |
| Plowing | | | | | | | |
| Pit preparation | | | | | | | |
| Planting | | | | | | | |
| Fencing | | | | | | | |
| Watering | | | | | | | |
| Replanting | | | | | | | |
| Weeding | | | | | | | |
| Intermediate cutting | | | | | | | |
| Thinning | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Others | | | | | | | |

24. How much tax for your land do you pay per year …….....

25. How do you sell your Eucalyptus products?

| Products | Pole | Firewood | Charcoal | Others | Remarks |
|---|---|---|---|---|---|
| Standing tree | | | | | |
| Felled tree | | | | | |
| Debranching | | | | | |
| Debarking | | | | | |
| Forwarding to landing | | | | | |
| Others | | | | | |

Rank 1. Mostly preferred 2. Preferred 3. Less preferred 4. Not preferred

26. Why are you interested in the above way of selling? ……...

27. Do you know where your product goes? Do you know the price of your product at the subsequent places? ……

28. Where do you sale your *Eucalyptus* products? Who is the buyer? 1. Consumers 2. Middlemen 3. Wholesalers 4. Retailers. 5. Others. ……

| Product type | The buyer | Place | Why? |
|---|---|---|---|
| Pole | | | |
| Fuelwood | | | |
| Charcoal | | | |
| Others | | | |

29. Why you do not sell your products yourself to the market directly? ……
……

30. Where do you get the buyers? Are you active? Do they come to you or you yourself contacted them? Can you tell me the name of your buyer?.....
…….……...

31. Do you have the power to bargain? 1. Yes 2. No: If no, why……..

32. Are you satisfied with the current price of your product? 1. Yes 2. No: If no, why……

33. How often do you have sold *Eucalyptus* since you start planting?.....

34. When do you mostly sell the products from your woodlot?

| Product type | Months of the year | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Ap. | May | Jun. | Jul. | Au. | Sep. | Oc. | Nov. | Dec. |
| Pole | | | | | | | | | | | | |
| Fuelwood | | | | | | | | | | | | |
| Splitted wood | | | | | | | | | | | | |
| Others | | | | | | | | | | | | |

Rank 1. Mostly preferred 2. Preferred. 3. Less preferred 4. Not preferred

35. Why do you choose this month as the most preferred to sale your eucalyptus products? ……

36. Do you have constraints for your *Eucalyptus* production? 1. Yes ☐ 2. No ☐: If yes, what are the major constraints?

| Production constraint | Severity (1.2.3.4) | How are you overcome them? |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

Category 1. Most sever 2. Severs 3. Less sever 4. Not sever.

37. How is the payment mechanism arranged for your products?
    1. In Cash 2. In-kind 3. Delayed payment 4. Bank transfer 5. Credit 6. others explain…….....
38. Do you have a collaboration with other actors?
    1. Producers 2 Traders 3. Government forestry departments 4. NGO's 5. Others
39. What kind of assistance or service or support do you get to from the government and other institutions during the process of growing and selling your plantations?.....
    ……
40. You exploit, or others exploit you? ……...
41. Have you had any disputes with other actors during the course of harvesting and selling?
    1. Yes 2. No: If yes, please indicate ……...
42. What are your suggestions to improve your income and sustain the production of Eucalyptus woodlot?.....
43. What do you think about cooperative? Is it will be a solution to your problem and improve your *Eucalyptus* production?.....
    ……
44. Any suggestion or comments you want to give?
    ……

**Thank you for your cooperation.**

**II: Questioners for the Traders**

I am grateful to thank you for your willingness, respect and taking the time to fill this questionnaire'. This questionnaire is used for collecting information on the value chain of *Eucalyptus* pole and fuelwood and the and will be treated as confidential.

Name of Interviewer……. Date of interview ……
District……. Kebele (Village)……No.…….

1. General information
   A. Name of the respondent……..
   B. Sex of respondent: 1. Male ☐ 2. Female ☐
   C. Age of the respondent……...years
   D. Formal educational level of the respondent: 1. Formal education ☐ 2. Primary education ☐ 3. Secondary education ☐ 4. More that secondary education ☐
   E. Marital status: 1. Single ☐ 2. Married ☐ 3. Widow ☐ 4. Divorced ☐
   F. Number of people in the household……..
2. Are you a permanent resident in the area?.....
3. What is your main source of livelihood/occupation?.....

4. Do you have other livelihood activities? 1. Yes 2. No; If yes question no. 5

5. Rank your livelihood activities according to its contribution to your household needs?

| No. | Livelihood activity | Income (ETB)/year/ha | How long have you been involved in this livelihood activity |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |

6. Do you think *Eucalyptus* pole and fuelwood contribute to your livelihood? 1. Yes 2. No

If yes in what way, it supports you?.....

7. Which category of trader/ commercial operator are you? 1. Village merchant ☐ 2. City merchant ☐ 3. Company ☐ 4. Middlemen/broker ☐ 5. Agent for company ☐ 6. Others ☐……..
8. What is your *Eucalyptus* business? 1. Pole ☐ 2. Fuelwood ☐ 3. Splitted wood ☐ 4. Others ☐ specify……..
9. How long have you been engaged in this business?.....years
10. How did you get in this business? What Motivates you?.....
……
11. Have you got market information? 1. Yes ☐, 2. No ☐ if yes from whom? Friends ☐ 2. From media ☐ 3. A direct visit to the markets ☐ 4. Others ☐ specify…...
12. From where do you purchase *Eucalyptus* products? 1. At the production site ☐ 2. At local market ☐ 3. Landing area ☐ 4. Others ☐ specify…….....
13. What are your preferences for the above question? 1. Most preferred ☐ 2. Preferred ☐ 3. Less preferred ☐ 4. Not preferred ☐
14. From whom do you purchase your products?

| **Suppliers** | **Products** | | | **Preferences** |
|---|---|---|---|---|
| | Pole | Fuelwood | Splitted wood | |
| Producer | | | | |
| Middlemen | | | | |
| Agents | | | | |
| Others | | | | |

Rank 1. Mostly preferred 2. Preferred 3. Less preferred 4. Not preferred

15. Why do you choose to buy *Eucalyptus* products from them? ……..
16. To whom did you sell your products? Do they come to you or you yourself contacted them?.....
……
17. What is your mode of contact with your customers?.....
18. Did you have any collaboration with others traders/your suppliers/buyers?

| Collaborative with | Types of collaboration | Comments |
|---|---|---|
| Producers | | |
| Other traders | | |
| Government finance department | | |
| NGO's | | |
| Others | | |

19. How do you purchase *Eucalyptus* base products? 1. Standing tree ☐ 2. Felled/processed/ ☐ 3. Fuelwood ☐ 4. Charcoal ☐ 5. Others ☐ specify……
20. What is the current purchasing price per kada/hectare at your ranking preferred location of purchase……
……
21. Who determines the price? 1. Seller ☐ 2. Purchaser ☐ 3. Market ☐4. Others please specify……
22. What factors are considered in setting up the price of Eucalyptus pole and fuelwood? (Please rank) 1. production costs ☐ 2. Transportation costs ☐ 4. Quality ☐ 5. Seasonality ☐ 7. others (specify)……...
23. Do you store the products before selling? 1. Yes ☐ 2. No ☐, If yes: question 24,
24. Where are you storing the products? 1. Own store ☐ 2. Rent ☐3. Communal land ☐ 4. Others please specify……and how long……days/months
25. What is the storage cost per month? 1. Tax…….. 2. Charge……. 3. Others specify ……
26. Where do you sell your *Eucalyptus* products? Please specify the name of the places.

| **Site** | **Distance from the landing** | **Products** | | |
|---|---|---|---|---|
| | | Poles | Fuelwood | Splitted wood |
| On-site | | | | |
| Local market | | | | |
| Sale to the regional market | | | | |
| Sale to the export market | | | | |
| Others | | | | |

27. Where do you get the information for a price about *Eucalyptus* pole and fuelwood trade? ……...……
28. What transportation means are you used?

| **Means of transportation** | **Products** | | **Distance to the market and cost payed** |
|---|---|---|---|
| | Pole | Fuelwood | |
| Manpower | | | |
| Donkey cartload | | | |
| Vehicle | | | |
| Others | | | |

29. What is your selling price in the last 5 years per tree/kada/hectare?

| Selling price per unit of products | Years | | | | | Future expectation |
|---|---|---|---|---|---|---|
| | 2014 | 2015 | 2016 | 2017 | 2018 | |
| Pole | | | | | | |
| Fuelwood | | | | | | |
| Splitted wood | | | | | | |
| Others | | | | | | |

30. Are you satisfied with the current price of your products? 1. Yes 2. No, If No, why?.....
31. What factors influence the price? And how the price of the product changes?

| Ranking | Products | | | Remarks |
|---|---|---|---|---|
| | Pole | Fuelwood | Splitted wood | |
| High demand | | | | |
| Low demand | | | | |
| High supply | | | | |

| | | | | |
|---|---|---|---|---|
| Low quality | | | | |
| Others | | | | |

Rank 1. Best driving factor 2. Good rank 3. Moderate 4. Bad

32. What might be the option to get a better price from your product?.....
……

33. What are the activities/ values you add to increase your selling price or volume?

| Activities | Price per unit | Reasons for that |
|---|---|---|
| | | |
| | | |
| | | |

34. Are there any difficulties in selling your products?.....
35. List daily/monthly/ yearly expense related to your business activities, including your duties and fees.

| Kind of cost | Amount per day/month/year |
|---|---|
| Tax and duties | |
| Rent | |
| Labour | |
| Transportation | |
| Security | |
| Tools used | |
| Others | |

36. What is your primary source of finance for your business?

| Financing mechanism | Amount per year | Ranking by preferences |
|---|---|---|
| Self-financing | | |
| Credit from bank | | |
| Credit from a local organization | | |
| Mutual help | | |
| Others | | |

Rank 1. Most preferred 2. Preferred 3. Less preferred 4. Not preferred

37. What skills are necessary to do the business?.....
…….
38. Do you think you exploited others or are exploited by any actors?.....
39. What types of right do you have over the trade of *Eucalyptus* pole and fuelwood?.....
……
40. What do you think the main sources of getting access to the trade of *Eucalyptus* pole and fuelwood, excluding legal or property right?.....
41. What are the requirements to get the official permit to run your business?.....
……
42. What is the main important attribute that your buyer expects from you? E.g. time, quality, place, labour, storage places etc…….
43. Have paid payments unofficially to the product? Can this control? Whose responsibility is that?
……
44. What are the main problems you face in the course of your business activities?
……
45. Do you get any support or services from any organization or government department? 1. YES 2. NO: If your answer is yes, what type of support? And from Whom?

.....

46. Have you ever received training on how to improve *Eucalypts* pole and fuelwood business? 1. Yes 2. No: If yes please explain?.....

47. Any suggestion or comments you want to give?

……

**Thank you for your cooperation**

**III. Questioners for the Key informant interview**

1. What are the products of *Eucalyptus* in the village?

| **Products** | **Remark** |
|---|---|
| Pole | |
| Fuelwood | |
| Charcoal | |
| leaves | |
| others | |

2. How are the products line from producer to consumer?.....

.....

3. What are the main activities carried out in the production of *Eucalyptus* products?

| No. | Nod | Activities | Inputs |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |

4. Who are the key actors along the *Eucalyptus* pole and fuelwood value chain?.....

……...

5. What are the value-added activities performed in the *Eucalyptus* pole and fuelwood value chain?

……..

**6.** How many *Eucalyptus* pole and fuelwood value dealers have been registered in your district in year 2017/2018?.....

6.1. How much is the charge as a tax for *Eucalyptus* pole and fuelwood business?

A. Growers …….. B. Traders……

7. What other charges do you absorb from *Eucalyptus* pole and fuelwood dealers/traders, Apart from formal tax?.....

7.1. What is the regulation in the chain?.....

……...

8. Factors which if there are absent, the chain is significantly modified?.....

……...

9. What are the supporting environments or supporting bodies in the value chain?

| No. | Actor (Producer, trader, retailer) | What type of supplies and services | Who is the provider (Official, guy NGO others) | How they are interacting? Who is approaching whom? |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |

10. How the actors are organized (coordinated)?

10.1. Who determines the price of the products? 1. Seller 2. Buyer 3. Other actors

Explain (Who is approaching whom for cutting, harvesting etc) …….
……..

11. Do actors have the power to bargain the price? 1. Yes 2. No: If no why……...
12. Where are the marketplaces? ……
13. How the negotiation and exchange take place? How actor groups are contacted?.....
    ……...
14. What types of right do you think actors have on *Eucalypts* pole and fuelwood?.....
    ……...
15. What strategies/programs/policies/incentives by government or development partners if put in place would enable growth in the *Eucalyptus* pole and fuelwood business and improve chain value addition?
    ……..
16. Is there any social organization for eucalyptus pole and fuelwood? 1. Yes 2. No, if yes no. 17
17. What are they…….
18. Do you have any information about cooperatives? 1. Yes 2. No: If yes please describe? ……
    ……...
19. Do farmers work together? Is it attractive to put together two or three woodlots together?
    ……...
20. What are the gaps, problems and ideas to overcome the problems?.....
    ……...
21. Do you think cooperatives will be the solution to improve the chain.?.....
22. What other solutions do you think help to improve the value chain of *Eucalyptus* pole and fuelwood?
    ……...
23. Do you have any other suggestions or comments?.....
    ……...

**Thank you for your cooperation**

**IV. Focus Group Discussion at eucalyptus grower level**

1. Introduction of members, both research team and focus group participants and purpose of gathering
2. Who are the main key actors involved in the chain?
3. Could you explain the history of *Eucalyptus* planting in the Chefasine?
4. What are the contributions and roles of *Eucalyptus* pole and fuelwood in Chefasine?
5. What are the value-added activities performed in the chain at tree growers and trader level?
6. According to the key informant and in-depth interview, we cannot find any service that feeds into the system from NGO's and government, what is your idea or opinion for this?
7. We found that tree growers do not have any information about marketing and production and is received a lower share from the final price, would you agree on this?
8. What regulations are there in their *Eucalyptus* production and marketing?
9. What are the challenges and important factors affecting *Eucalyptus* production and marketing?
10. The result shows shallow or absence of interaction in between and among the actor's groups, what is your idea and how it will be solved?
11. What solutions could you suggest improving the chain generally?
12. Is cooperative will be the solution for the improvement of *Eucalyptus* pole and fuelwood business of actors?

**Thank you for your cooperation**

**Appendix II: Benefit, cost and margin of *Eucalyptus* pole and fuelwood at each actor level per hectare per year.**

| **1) The benefit, cost and margin of *Eucalyptus* pole and fuelwood at tree growers level per hectare per year.** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| □ An average number of trees produced by tree grower per year per hectare 16,129. | | | | | | | | |
| □ Quantity sold as pole per five years of rotation: 85% of the total pole =13,710, Quantity sold per year, 2742 trees/hectare. Spacing of 0.55 * 0.69 | | | | | | | | |
| | | Unit | Quantity | Unit price (ETB) | Total value (ETB) | Total value per hectare | Amortized value (ETB)/ha | Value (US $) |
| Total revenue (Average production *Average price) | | Number of trees | 2,742 | 13 | 35,646 | 35,646 | - | 1,308 |
| Costs of producing 2,720 trees per hectare | | | | | | | | |
| Seedling | | Number of seedlings | 536.63 | 2 | 1,073.26 | 3,462.13 | 844.33 | 30.98 |
| Management cost | Land preparation including nursery | Man days | 5 | 66 | 330 | 1,064.52 | 259.63 | 9.53 |
| | Transportation (seedling) | Man days | 2 | 66 | 132 | 425.81 | 103.85 | 3.81 |
| | Planting | Man days | 5 | 66 | 330 | 1,064.52 | 259.63 | 9.53 |
| | Weeding and Hoeing (1st & 2nd year) | Man days | 12 | 66 | 792 | 2,554.84 | 623.10 | 22.86 |
| | Thinning | Man days | 2 | 66 | 132 | 425.81 | 103.85 | 3.81 |
| | Fencing | Man days | 2 | 66 | 132 | 425.81 | 103.85 | 3.81 |
| Sub total cost | | | | | | | 2,298.29 | 84.34 |
| Land rent | | Hectare | 1 | 65 | 65 | 65 | 65 | 2.39 |
| Total cost | Sum of all expense | | | | 2,948 | 4,562 | 2,364 | 86.75 |
| Margin | | | | | | | 33,282 | 1,221 |
| Gross Profit Margin | Revenue less Total cost/Revenue *100 | | | | | | 93% | |

| **2) Benefit and cost analysis for 2,742 *Eucalyptus* pole value chain from Chefasine to Hawassa at middlemen level.** | | | | | | |
|---|---|---|---|---|---|---|
| Middlemen: A truck loads, 500 to 600 poles (on average 550 poles) and sold at a price of US $ 514 (14,000 ETB) to US $ 734 (20,000 ETB), on average USD $ 624 (17,000 ETB), which means US $ 1.12 (31 ETB) per pole. | | | | | | |
| | | Unit | Quantity | Unit price (ETB) | Total value (ETB) | Value (US $) |
| Costs for 2,742 trees/ hectare | | | | | | |
| Product cost | | Number of trees | 2,742 | 13 | 35,646 | 1,308 |
| Transportation cost including driver | | Truck | 5 | 1,100[4] | 5,500 | 202 |
| Harvesting and debranching | | Truck | 5 | 150[5] | 750 | 27.53 |
| Stacking and loading | | Truck | 5 | 150[6] | 750 | 27.53 |
| Unloading | | Truck | 5 | 100[7] | 500 | 18.35 |
| Tax | | Pcs | 1 | 250 | 250 | 9.17 |
| Commission fee | | Pcs | 1 | 100 | 100 | 3.67 |
| For broker | | Pcs | 1 | 250[8] | 250 | 9.17 |
| Mobile card for communication | | Mobile card | 5 | 50 | 250 | 9.17 |
| Total Cost | Sum of all costs | | | | 43,996 | 1,615 |
| Revenue | Quantity * Unit price | | 2,742 | 31 | 85,002 | 3,120 |
| Margin | Revenue less Total cost | | | | 41,006 | 1,505 |
| Gross Profit Margin | Revenue less Total cost/Revenue * 100 | | | | 48% | |

Note: All the harvesting, stacking, loading and unloading activities are done by hired labourers.

[4] For transporting a truck of *Eucalyptus* poles from Chefasine to Hawassa town, 800 to 1,200 ETB (1,100 ETB on average) including the cost of the driver was needed,

[5] Harvesting, debranching, staking, loading and unloading activities are done by hired labourers as a contract work. To harvest and debranch a Kada (7 trucks) of *Eucalyptus*, 800 to 1,300 ETB (on average 1,050 ETB) was required. That means, the middlemen incur a cost of 150 ETB to harvest and debranch a truck of *Eucalyptus* poles.

[6] On average, 1,050 ETB for a Kada of *Eucalyptus* was required to stack the harvested poles on one place and load it on the truck. Which means, for a truck 150 ETB was paid by the middlemen.

[7] 80 to 120 ETB (100 ETB, on average) was required to unload a truck of poles at Hawassa.

[8] Brokers received 100 to 300 ETB, on average 250 ETB, from a hectare or a Kada of *Eucalyptus*.

| **3) Benefit and cost analysis of *Eucalyptus* pole value chain from Chefasine at Tulla pole wholesaler and retailer level.** | | | | | | |
|---|---|---|---|---|---|---|
| Tulla pole wholesaler and retailer: These traders bought *Eucalypts* from the tree grower as standing tree (stumpage) with an average price of 13 ETB per tree | | | | | | |
| | | Unit | Quantity | Unit price (ETB) | Total value (ETB) | Value (US $) |
| Costs for 2,742 trees/ Hectare | | | | | | |
| Product cost | | Number of trees | 2,742 | 13 | 35,646 | 1,308 |
| Transportation cost including driver | | Truck including | 5 | 600[9] | 3000 | 110.09 |
| Harvesting and debranching | | Truck | 5 | 100[10] | 500 | 18.35 |
| Stacking in one place and loading on to the truck | | Truck | 5 | 150 | 750 | 27.52 |
| Unloading from truck | | Truck | 5 | 100 | 500 | 18.35 |
| Pole arrangement | | Truck | 5 | 50 | 250 | 9.17 |
| Tax | | Pcs | 1 | 100 | 100 | 3.67 |
| Unofficial fees | | Pcs | 1 | 100 | 100 | 3.67 |
| Registration fee | | Pcs | 1 | 100 | 100 | 3.67 |
| Broker | | Pcs | 1 | 250 | 250 | 9.17 |
| Mobile card for communication | | Mobile card | 5 | 25 | 125 | 4.58 |
| Total cost (sum of all costs) | | | 2,761 | | 41,321 | 1,516 |
| Revenue | Quantity * Unit price | | 2,742 | 37 | 101,454 | 3,723 |
| Margin | Revenue less Total cost | | | | 60,133 | 2,187 |
| Gross Profit Margin | Profit/Revenue * 100 | | | | 59 % | |

| **4) Benefit and cost analysis of *Eucalyptus* pole value chain from Chefasine at Hawassa pole wholesaler and retailer level.** | | | | | | |
|---|---|---|---|---|---|---|
| | | Unit | Quantity | Unit price (ETB) | Total value (ETB) | Value (US $) |
| Costs for 2,720 trees per hectare | | | | | | |
| Product cost | | Number of trees | 2,742 | 31 | 85,002 | 3119 |
| Pole arrangement | | Truck | 5 | 120 | 600 | 22.02 |
| Tax | | Pcs | 1 | 125 | 125 | 4.59 |

[9] On average 600 ETB (500 to 700 ETB) is required for the transportation of a truck of *Eucalyptus* poles from Chefasine to Tulla, including the cost of the driver.

[10] On average Tulla pole wholesalers and retailers paid 700 ETB for harvesting and debranching of a Kada of *Eucalyptus*. That means, on average 100 ETB was incurred by them for harvesting and debranching of a truck of poles (1 Kada = 7 trucks of poles).

| | | | | | | |
|---|---|---|---|---|---|---|
| Mobile card for communication | | Mobile card | 5 | 25 | 125 | 4.59 |
| Security | | Labour (hired) | 1 | 50 | 50 | 1.83 |
| Registration and commission fee | | Pcs | 1 | 200 | 200 | 7.34 |
| Unofficial fee | | Pcs | 5 | 50 | 250 | 9.17 |
| Total cost | Sum of all costs | | | | 86,352 | 3,169 |
| Revenue | Quantity * Unit Price | | 2,742 | 48 | 131,616 | 4,830 |
| Margin | Revenue less Total cost | | | | 45,264 | 1,661 |
| Gross Profit Margin | Revenue less Total cost/Revenue*100 | | | | 34% | |

| 5) **The benefit, cost and margin for 5 donkey cart loads of *Eucalyptus* fuelwood for middlemen** | | | | | | |
|---|---|---|---|---|---|---|
| | | Unit | Quantity | Unit price (ETB) | Total value (ETB) | Value (US $) |
| Cost for one tree 5 donkey cartloads of fuelwood | | | | | | |
| Product cost | | Number of trees | 1 | 300 | 300 | 11.01 |
| Harvesting and splitting into pieces | | Man days | 4[11] | 65 | 260 | 9.54 |
| Loading and unloading | | Cartload | 5[12] | 50 | 250 | 9.17 |
| Transportation cost including donkey cart driver | | Cartload | 5[13] | 60 | 300 | 11.01 |
| Total cost | Sum of all costs | | | | 1,110 | 40.73 |
| Revenue | Quantity * Unit price | Load (800 pieces of wood) | 5 | 800 | 4,000 | 146.79 |
| Margin | Revenue less Total cost | | | | 2,890 | 106.06 |
| Gross Profit Margin | Revenue less Total cost/Revenue*100 | | | | 72% | |

| **6) The benefit, cost and margin for 5 donkey cartloads of *Eucalyptus* fuelwood for large fuelwood retailer level.** | | | | | | |
|---|---|---|---|---|---|---|
| | | Unit | Quantity | Unit price (ETB) | Total value (ETB) | Value (US $) |
| Costs for 5 donkey cart loads of fuelwood | | | | | | |
| Product cost | | Cartload | 5 | 800 | 4,000 | 146.79 |
| Tax | | Cartload | 5 | 5 | 25 | 0.92 |
| Unloading and arranging | | Cartloads | 5 | 10 | 50 | 1.83 |
| Total cost | Sum of all costs | | | | 4,075 | 149.54 |

[11] To harvest and split in to 1 m logs of fuelwood, the middlemen were used 4 workers per day with a cost of 65 ETB per worker.
[12] The tree produced 5 donkey cartloads of fuelwood (One cartload is equal to 800 pieces of wood)
[13] Transporting cartloads of fuelwood from Chefasine to Tulla costs 60 ETB.

| | | | | | | |
|---|---|---|---|---|---|---|
| Revenue | Quantity * Unit price | Load (800 pieces of wood | 5 | 880[14] | 4,400 | 161.47 |
| Margin | Revenue less Total cost | | | | 325 | 11.93 |
| Gross Profit Margin | Revenue less Total cost/Revenue*100 | | | | 7% | |

| **7) The benefit, cost and margin for 5 donkey cartloads of *Eucalyptus* fuelwood for small fuelwood retailer level (Flyers)** | | | | | | |
|---|---|---|---|---|---|---|
| | | Unit | Quantity | Unit price (ETB) | Total value (ETB) | Value (US $) |
| Costs for 5 donkey cartloads of fuelwood | | | | | | |
| Product cost | | Cartloads | 5 | 880 | 4,400 | 161.47 |
| Transportation cost | | Cartloads | 5 | 20[15] | 100 | 3.67 |
| Labour cost | | Cartloads | 5 | 16[16] | 80 | 2.94 |
| Total cost (Sum of all costs) | | | | | 4,580 | 168.08 |
| Revenue | Quantity *Unit price | Donkey cartload | 5 | 1,000[17] | 5,000 | 183.48 |
| Margin | | | | | 420 | 15.41 |
| Gross profit margin | Revenue less Total cost/Revenue*100 | | | | 8.4% | |

[14] Large fuelwood wholesalers and retailer sold one pieces of fuelwood in 1.10 ETB.
[15] Transportation of one cartloads of fuelwood costs on average 20 ETB (15 to 25 ETB) at Tulla town and 30 to 40 ETB at Hawassa town
[16] To vend one cartloads of fuelwood on average flayers needs 2 hours (on average 8 working hour per day with 65 ETB). So, 16 ETB per carloads were needed.
[17] Small fuelwood retailers sold one pieces of fuelwood in 1.25 ETB.

**Appendix III: Gross margin of selected crops in Chefasine.**

| I | **Gross margin for a hectare of *Eucalyptus* at Chefasine kebele (5 years of average rotation age)** | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Variable cost | Unit | Quantity | Unit price | Cost/unit area (0.31) | Cost/ha/year (ETB) | Amortised cost/ha/Year (ETB) |
| | Establishment cost (A) | | | | | | |
| 1 | Land preparation including, a nursery for seedling growing | Man days | 4 | 66 | 264 | 852 | 208 |
| 2 | Seedling | No. | 700 | 2 | 1,400 | 4,516 | 101 |
| 3 | Seedling transportation | Man days | 2 | 66 | 132 | 426 | 104 |
| 4 | Planting | No. | 4 | 66 | 264 | 852 | 208 |
| 5 | Weeding and hoeing (first and second year) | Man days | 10 | 66 | 660 | 2,129 | 519 |
| 6 | Fencing | Man days | 2 | 66 | 132 | 426 | 104 |
| 7 | Thinning | Man days | 2 | 66 | 132 | 426 | 104 |
| 8 | Total variable cost | | | | | 9,626 | 1,347 |
| 9 | Revenue (D) | Number | 5,000 | 13 | 65,000 | 209,677 | 41,935 |
| 10 | Gross margin (D-C) | | | | | 200,052 | 40,588 |
| 11 | Gross margin in US$ (exchange rate 1US$=27.25 | | | | | 7,341 | 1,489 |

| **II** | **Gross margin for a hectare of khat at Chefasine kebele (30 years of lifespan)** | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Variable cost | Unit | Quantity | Unit price | Cost/unit area (0.89) | Cost/ha/year (ETB) | Total cost/ha/year |
| | **Establishment cost (A)** | | | | | | |
| 1 | Land preparation | Man days | 16 | 65 | 1,040 | 1,168.54 | 94.17 |
| 2 | Seedling | Number | 580 | 7 | 4,060 | 4,561.80 | 367.62 |
| 3 | Seedling transport | Man days | 1 | 65 | 65 | 73.03 | 5.89 |
| 4 | Planting | Man days | 6 | 65 | 390 | 438.20 | 35.31 |
| 5 | **Subtotal cost** | | | | | 6,241.57 | 502.99 |
| **6** | **Annual cost (B)** | | | | | | |
| 7 | Weeding and hoeing (2 times/year) | Man days | 30 | 65 | 1,950 | 2,191.01 | 2,191.01 |
| 8 | Fertiliser | Kg | 100 | 11.75 | 1,175 | 1,320.22 | 1,320.22 |
| 9 | Collection (2 times per year) | Man days | 42 | 65 | 2,730 | 3,067.42 | 3,067.42 |
| 10 | Transportation | Zubra | 2,790 | 5 | 13,950 | 15,674.16 | 15,674.16 |
| 11 | Subtotal cost | | | | | 22,252.81 | 22,252.81 |
| 12 | **Total variable cost (C= A + B)** | | | | | 28,494.38 | 22,755.79 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | **Revenue (Quantity * Price) (D)** | Zubra | 1654 | 30 | 49,620 | 55,753 | 55,753 |
| 14 | **Gross margin (Revenue less Total variable cost (E= D-C)** | | | | | 27,258 | 32,997 |
| | Gross margin in US$ (exchange rate 1US$=27.25 | | | | | 1,000 | 1,211 |

| **III** | **Gross margin for a hectare of coffee at Chefasine kebele, Sidama zone (ETB) (25 years of lifespan)** | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Variable cost | Unit | Quantity | Unit price | Cost/unit area (0.89) | Cost/ha/year (ETB) | Total cost/ha/year |
| | **Establishment cost (A)** | | | | | | |
| 1 | Land preparation | Man days | 25 | 65 | 1625 | 1,825.84 | 156.68 |
| 2 | Compost preparation | Man days | 4 | 65 | 260 | 292.13 | 25.07 |
| 3 | Compost transport | Man days | 0.5 | 40 | 20 | 22.47 | 1.93 |
| 4 | Seedling | No. | 213 | 3 | 639 | 717.98 | 61.61 |
| 5 | Seedling transport | Man days | 1 | 65 | 65 | 73.03 | 6.27 |
| 6 | Planting | Man days | 2 | 65 | 130 | 146.07 | 12.53 |
| 7 | Subtotal cost | | | | | **3,077.53** | **264.08** |
| | **Annual cost (B)** | | | | | | |
| 8 | Weeding and Hoeing | Man days | 24 | 65 | 1560 | 1,752.81 | 1,752.81 |
| 9 | Fertiliser | Kg | 55 | 11.75 | 646.25 | 726.12 | 726.12 |
| 10 | Mulching | Man days | 5 | 65 | 325 | 365.17 | 365.17 |
| 11 | Collection | Man days | 18 | 65 | 1170 | 1,314.61 | 1,314.61 |
| 12 | Pulping | Man days | 2 | 65 | 130 | 146.07 | 146.07 |
| 13 | Washing | Man days | 2 | 65 | 130 | 146.07 | 146.07 |
| 14 | Drying | Man days | 1 | 65 | 65 | 73.03 | 73.03 |
| 15 | Transportation | Kg | 335 | 5 | 1675 | 1,882.02 | 1,882.02 |
| 16 | Subtotal cost | | | | | **6,405.90** | **6,405.90** |
| 17 | **Total variable cost (C= A + B)** | | | | | **9,483.43** | **6,669.98** |
| 18 | **Revenue (Quantity * Price) (D)** | Kg | 335 | 90 | 30150 | **33,876.40** | **33,876.40** |
| 19 | **Gross margin (Revenue less Total variable cost (E= D - C)** | | | | | **24,392.98** | **27,470.51** |
| | Growth Margin in US$ (exchange rate 1US$=27.25 | | | | | 895.16 | 1008.09 |

| IV | **Gross margin for a hectare of enset at Chefasine kebele, Sidama zone (ETB) (**6 years of lifespan) | | | | | | |
|---|---|---|---|---|---|---|---|
| NO. | Variable cost | Unit | Quantity | Unit price | Cost/unit area (0.89) | Cost/ha/year (ETB) | Total cost/ha/year |
| | **Establishment cost (A)** | | | | | | |
| 1 | Land preparation | Man days | 4 | 65 | 260 | 292.13 | 61.28 |
| 2 | Seedling | Number | 270 | 0.6 | 162 | 182.02 | 38.18 |
| 3 | Seedling transport | Man days | 1 | 65 | 65 | 73.03 | 15.32 |
| 4 | Planting | Man days | 3 | 65 | 195 | 219.10 | 45.96 |
| 5 | Subtotal cost | | | | | 766.29 | 160.76 |
| | **Annual cost (B)** | | | | | | |
| 7 | Weeding and Hoeing (2 times/year) | Man days | 8 | 65 | 520 | 584.27 | 584.27 |
| 8 | Compost | Man days | 2 | 65 | 130 | 146.07 | 146.07 |
| 9 | Harvesting | Man days | 42 | 65 | 2,730 | 3,067.41 | 3,067.41 |
| 10 | Subtotal cost | | | | | 3,797.75 | 3,797.75 |
| 11 | Total variable cost (C= A + B) | | | | | 4,564.04 | 3,958.52 |
| 12 | Revenue (Quantity * Price) (D) | Kg | 270 | 18 | 4,860 | 5,460.67 | 5,460.67 |
| 13 | Gross margin (Revenue less Total variable cost) (D-C) | | | | | 896.63 | 1,502.15 |
| 14 | Gross margin in US$ (exchange rate 1US$=27.25) | | | | | 32.90 | 55.12 |

| V | **Gross margin for a hectare of maize at Chefasine kebele, Sidama zone (ETB)** | | | | | |
|---|---|---|---|---|---|---|
| No. | Variable cost | Unit | Quantity | Unit price | cost/unit area (0.39) | Cost/ha/year (ETB) |
| | Establishment cost (A) | | | | | |
| 1 | Ploughing (2 times) | Man days | 4 | 65 | 260 | 667 |
| 2 | Seed (Improved) | Kg | 3 | 50 | 150 | 385 |
| 3 | fertiliser (DAP and UREA) | Kg | 12 | 11.77 | 141.24 | 362 |
| 4 | Oxen for ploughing | Number | 2 | 1,400 | 2,800 | 7,179 |
| 5 | Sowing | Man days | 2 | 65 | 130 | 333 |
| 6 | Weeding and hoeing (2 times) | Man days | 2 | 65 | 130 | 333 |
| 7 | Fertiliser application | Man days | 4 | 65 | 260 | 667 |
| 8 | Subtotal | | | | | 9,926 |
| 9 | Other costs (B) | | | | | |
| 10 | Harvesting and threshing | Man days | 2 | 65 | 130 | 333.33 |
| 11 | Transportation | Kg | 508 | 0.05 | 25.4 | 65.13 |
| 12 | Subtotal | | | | 155.4 | 398.46 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | Total variable cost (C= A+ B) | | | | | 10,325 |
| 14 | Revenue (D) | Kg | 650 | 8 | 5,200 | 13,333.33 |
| 15 | Gross margin (Revenue less total variable cost (D-C)) | | | | | 3,009 |
| | Gross margin in US$ (exchange rate 1US$=27.25) | | | | | 110.41 |

| VI | **Gross margin for a hectare of Haricot bean at Chefasine kebele, Sidama zone (ETB)** | | | | | |
|---|---|---|---|---|---|---|
| No. | Variable cost | Unit | quantity | Unit price | Price/unit area (0.89) | Price/ha/year (ETB) |
| | Annual cost | | | | | |
| 1 | Land preparation (clearing) | Man days | 4 | 65 | 260 | 292.13 |
| 2 | Seed | Kg | 2 | 15 | 30 | 33.71 |
| 3 | Sowing | Man days | 4 | 65 | 260 | 292.13 |
| 4 | Weeding | Man days | 2 | 65 | 130 | 146.07 |
| 5 | Collecting and Threshing | Man days | 2 | 65 | 130 | 146.07 |
| 6 | Transport | Kg | 200 | 0.1 | 20 | 22.47 |
| 7 | Total variable cost | | | | | 932.58 |
| 8 | Revenue (Quantity * price) | Kg | 200 | 15 | 3000 | 3370.79 |
| 9 | Gross margin (Revenue less Total variable cost | | | | | 2438.20 |
| | Gross margin in US$ (exchange rate 1US $=27.25 | | | | | 89.48 |

| VII | **Gross margin for a hectare of vegetables at Chefasine kebele, Sidama zone (ETB)** | | | | | |
|---|---|---|---|---|---|---|
| No. | Variable cost | Unit | Quantity | Unit price | Cost/unit area (0.89) | Total cost /ha/year (ETB) |
| | Annual cost | | | | | |
| 1 | Land preparation | Man days | 1 | 65 | 65 | 73.03 |
| 2 | Seed | Pieces | 1 | 50 | 50 | 56.18 |
| 3 | Sowing | Man days | 1 | 65 | 65 | 73.03 |
| 4 | Weeding | Man days | 1 | 65 | 65 | 73.03 |
| 5 | Collecting | Man days | 0.5 | 65 | 32.5 | 36.52 |
| 6 | Total variable cost | | | | | 311.80 |
| 7 | Revenue (Quantity * Price) | | | | 400 | 449.44 |
| 8 | Gross margin (Revenue less Total variable cost | | | | | 137.64 |
| 9 | Gross Margin in US$ (exchange rate 1US$=27.25 | | | | | |

| VIII | **Gross margin for a hectare of Banana, Avocado, and Gesho at Chefasine kebele (15 years of average lifetime)** | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Variable cost | Unit | Quantity | Unit price | Cost/unit area (0.89) | Total Cost/ha/year (ETB) | Total cost/ ha/year ETB |
| | Establishment cost (A): Average lifetime 15 years were used. | | | | | | |
| 1 | Land preparation and planting | Man day | 2 | 65 | 130 | 146.07 | 16.04 |
| 2 | Seedling of Banana | Number | 50 | 5 | 250 | 280.90 | 30.84 |
| 3 | Seedling of Avocado | Number | 25 | 8 | 200 | 224.72 | 24.67 |
| 4 | Seed of Gesho *(Rhamnus prinoides)* | Kg | 0.5 | 15 | 7.5 | 8.43 | 0.93 |
| 5 | Seedling transportation | Man days | 1 | 65 | 65 | 73.03 | 8.02 |
| 6 | Subtotal | | | | | 733.15 | 80.50 |
| | **Annual cost (B)** | | | | | | |
| 8 | Weeding and hoeing | Man days | 4 | 65 | 260 | 292.13 | 292.13 |
| 9 | Collecting | Man days | 3 | 65 | 195 | 219.10 | 219.10 |
| 10 | Transportation cost (Banana + Avocado + Gesho) | | | | 220 | 247.19 | 247.19 |
| 11 | Subtotal | | | | | 758.43 | 758.43 |
| **12** | Total variable cost (C= A+B) | | | | | 1,491.57 | 838.92 |
| 13 | Revenue (Quantity * Price), Banana | Kg | 30 | 14 | 420 | 471.91 | 471.91 |
| 14 | Revenue (Quantity * Price), Avocado | Kg | 43 | 18 | 756 | 849.44 | 849.44 |
| 15 | Revenue (Quantity * Price), Gesho | Kg | 20 | 30 | 600 | 674.16 | 674.16 |
| **16** | Total revenue (Banana + Avocado + Gesho) (D) | Kg | 143 | | | 1,995.51 | 1,995.51 |
| **17** | Gross margin (Revenue less Total variable cost) (C – D). | | | | | 503.93 | 1,156.58 |
| 18 | Gross margin in US$ (exchange rate 1US$=27.25 | | | | | 8.49 | 42.44 |

| IX | **Gross margin for a hectare of *Cordia africana* at Chefasine kebele (20 years of average lifetime)** | | | | | | |
|---|---|---|---|---|---|---|---|
| No. | Variable cost | Unit | Quantity | Unit price | Cost/unit area (0.89)/year | Total cost/ha/year (ETB) | Amortised cost ETB $ha^{-1}year^{-1}$ |
| | Establishment cost | | | | | | |
| 1 | Planting | Man days | 0.25 | 65 | 16.25 | 18.26 | 1.72 |
| 2 | Seedling | Number | 5 | 10 | 50 | 56.18 | 5.30 |
| 3 | Harvesting and splitting | Man days | 4 | 65 | 260 | 292 | 292 |
| 4 | Transportation cost | Load | 5 | 50 | 250 | 281 | 281 |
| 5 | Total variable cost | | | | | 1,478.93 | 1,411.53 |
| 6 | Revenue (Quantity * price) | Number | 5 | 3,000 | 15,000 | 16,854 | 843 |
| 7 | Gross margin (Revenue less Total variable cost) | | | | | 16,207 | 263 |
| 8 | Gross margin in US$ (exchange rate 1US$=27.25 | | | | | 595 | 10 |

**Note:** To harvest cordia, tree growers in the area need to wait 15 to 25 years. Thus, on average 20 years of a lifetime were considered. Twenty years old of *Cordia africana* has produced 5 cartloads of timber and sold at 3,000 ETB. Forty to sixty ETB, on average fifty ETB, were required for transporting from Chefasine to Tulla and Hawassa towns, respectively.

**Appendix IV: *Eucalyptus* poles assortment and their respective price at different marketing places.**

| X | Price of different poles at Chefasine, Tulla and Hawassa area | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Amharic Name** | **A different assortment of *Eucalyptus* (Used to fix or connect)** | **Quantity** | | **Price at different locations/markets (ETB)** | | | | | | | | | **Overall mean** |
| | | | | **Chefasine** | | | **Tulla** | | | **Hawassa** | | | |
| | | Stem | Kg | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean | |
| **Ye Wuch Gedegeda Mager** | Construction wall from | 1 | | 11 | 16 | 13 | 16 | 20 | 18 | 25 | 35 | 30 | 20 |
| **Ye Wuste Gedgeda Mager** | Construction wall from inside | 1 | | 8 | 10 | 9 | 10 | 14 | 12 | 15 | 25 | 20 | 14 |
| **Qesete** | Connect top of wall and roof | 1 | | 19.5 | 25 | 22 | 25 | 35 | 30 | 34 | 50 | 42 | 31 |
| **Wraje** | The roof with the wall | 1 | | 30 | 50 | 40 | 55 | 80 | 68 | 70 | 86 | 78 | 62 |
| **Gureshume** | Inside and outside corner of the house | 1 | | 40 | 46 | 43 | 50 | 70 | 60 | 64 | 80 | 72 | 58 |
| **Ye Qoreqoro Magere** | the roof with the Weraje | 1 | | 16 | 20 | 18 | 20 | 26 | 23 | 36 | 45 | 40 | 27 |
| **Teshegagari** | A long pole, two said of the roof | 1 | | 75 | 82 | 78 | 70 | 100 | 85 | 80 | 120 | 100 | 88 |
| **Aerecho/ Chefeka** | Traditional/cottage construction | 1 | | 1.5 | 1.5 | 1.5 | 2 | 2 | 2 | 2 | 3 | 2.5 | 2 |
| **Mean of mean** | | | | | | 28 | | | 37 | | | 48 | |

**Appendix V: Photos from the field survey**

Discussion with DA's for sample selection

Interview and discussion with tree growers

*Eucalyptus* marketing at Hawassa (left) and Tulla town (right)

Donkey cartload of fuelwood (left) and truck of pole to the (right)

*Eucalyptus* fuelwood (left) and pole (right) vending area.

Disease during data collection, April 2018 (left) and at the end of May (right)

PIP workshop opening speech (Prof. Pretzsch and Prof. Tsegaye) (left) and problem prioritization by the trainers (right)

In-depth interview and Discussion with tree growers and brokers

Labour during loading and unloading

Scaffolding by *Eucalyptus* pole

Sources for all Figures: Autor (2018)